

Draft Environmental Impact Statement  
for the  
Roosevelt Habitat Conservation Plan  
Gila and Maricopa Counties, Arizona



U.S. FISH AND WILDLIFE SERVICE  
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DRAFT  
ENVIRONMENTAL IMPACT STATEMENT  
FOR THE  
ROOSEVELT HABITAT CONSERVATION PLAN

U.S. Fish and Wildlife Service  
Department of the Interior

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## **LIST OF ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT**

|                    |  |
|--------------------|--|
| AF                 | Acre-feet  |
| AGFD               | Arizona Game and Fish  |
| AMA                | Active Management Area   |
| AWS                | Assured Water Supply   |
| BO                 | Biological Opinion   |
| CAP                | Central Arizona Project  |
| CAWCS              | Central Arizona Water Control Study  |
| CFR                | Code of Federal Regulations  |
| Cities             | Cities with water rights in Modified Roosevelt: Chandler, Glendale, Mesa, Phoenix, Scottsdale, Tempe |
| Corps              | U.S. Army Corps of Engineers   |
| Cuckoo             | Yellow-billed cuckoo   |
| ADWR               | Arizona Department of Water Resources  |
| EA                 | Environmental Assessment   |
| EIS                | Environmental Impact Statement   |
| EO                 | Executive Order  |
| ESA                | Endangered Species Act   |
| Flycatcher         | Southwestern Willow Flycatcher   |
| FONSI              | Finding of No Significant Impact   |
| FPO                | Forest Protection Officer  |
| FWS                | U.S. Fish and Wildlife Service   |
| GRUSP              | Granite Reef Underground Storage Project   |
| HCP                | Habitat Conservation Plan  |
| IA                 | Implementing Agreement   |
| ITP                | Incidental Take Permit   |
| Listed species     | Species listed as federally threatened or endangered under the ESA                                   |
| Modified Roosevelt | Roosevelt Dam as modified by construction in the 1990s   |
| NCS                | New Conservation Space   |
| NEPA               | National Environmental Policy Act  |
| NRHP               | National Register of Historic Places   |
| Reclamation        | U.S. Bureau of Reclamation   |
| RHCP               | Roosevelt Habitat Conservation Plan  |
| ROD                | Record of Decision   |
| Roosevelt          | Roosevelt Dam and Reservoir  |
| RPA                | Reasonable and Prudent Alternative   |
| RPM                | Reasonable and Prudent Measure   |
| Section 10         | Section 10(a)(1)(B) of the ESA   |
| SOD                | Safety of Dams   |
| SROG               | Sub-regional Operating Group (operators of 91st Avenue Wastewater Treatment Plant)                   |
| SRP                | Salt River Project   |
| TCRU               | Tonto Creek Riparian Unit  |
| Reclamation        | U.S. Bureau of Reclamation   |
| USFS               | U.S. Forest Service  |

## ABSTRACT

The U.S. Fish and Wildlife Service (FWS) is considering issuance of an incidental take permit under Section 10(a)(1)(B) of the Endangered Species Act (ESA) to the Salt River Project (SRP) for continued operation of Theodore Roosevelt Dam and Lake. The permit would address the take of federally listed species incidental to operation of Roosevelt Dam and Lake. If the permit is approved, SRP will implement the Roosevelt Habitat Conservation Plan (RHCP) in fulfillment of requirements of the ESA. The RHCP provides measures to minimize and mitigate, to the maximum extent practicable, the effects of Roosevelt Dam operation on listed species and their habitat and to ensure that any take of listed species will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. A candidate species is also addressed in the event that it is listed in the future. The four species are: the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and Yuma clapper rail (*Rallus longirostris yumanensis*), the threatened bald eagle (*Haliaeetus leucocephalus*), and the yellow-billed cuckoo (*Coccyzus americanus*), a candidate species.

FWS is issuing this draft Environmental Impact Statement to evaluate the potential impacts associated with implementation of the RHCP and issuance of an incidental take permit, and to evaluate alternatives. Three alternatives, including a no action alternative (No Permit), are considered. The preferred alternative is issuance of an incidental take permit to allow continued operation of Roosevelt Dam and Lake up to the maximum elevation of 2,151 feet (Full Operation alternative), in conjunction with implementation of the RHCP. The Re-Operation alternative would involve FWS issuance of a permit authorizing the modified operation of Roosevelt Dam in order to reduce the short-term impact of reservoir operations on listed and candidate species. This alternative would also include measures to minimize and mitigate the take of federally listed species. The consequences of these actions on natural, cultural, and socioeconomic resources are discussed in this draft Environmental Impact Statement.

**Public Comment:** If you wish to comment on this draft Environmental Impact Statement, you may send comments to the address below. **Your comments must be received by close of business on September 17, 2002.** Please note that the names and addresses of people who comment become part of the public record. If you wish to have your name and/or address withheld, you must state this prominently at the beginning of your comments. Anonymous comments will not be considered. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public disclosure in their entirety. Please submit your comments as follows:

- **By mail or hand delivery:** Field Supervisor, U.S. Fish and Wildlife Service, 2321 West Royal Palm Road, Suite 103, Phoenix, AZ 85021
- **By fax:** (602) 242-2513
- **In person:** At a public hearing to be held on August 27, 2002, 6-9 p.m. at the offices of the Salt River Project, 1521 Project Drive, Tempe, AZ



## CONTENTS

|   |           |
|---|-----------|
| <b>Chapter 1 Purpose and Need.....</b>                                | <b>1</b>  |
| 1.1 Introduction.....   | 1         |
| 1.1.1 Relationship Between the EIS and the RHCP.....                  | 3         |
| 1.1.2 Document Organization .....                                     | 4         |
| 1.2 Purpose of the Proposed Action.....                               | 4         |
| 1.3 Need for the Proposed Action.....                                 | 5         |
| 1.4 Scoping and Public Involvement .....                              | 7         |
| 1.4.1 Advisory Group, Scoping, and Meetings.....                      | 7         |
| 1.4.2 Issues Raised during Scoping.....                               | 7         |
| 1.4.2.1 Water Supply Alternatives.....                                | 8         |
| 1.4.2.2 Impacts on the Flycatcher and Recovery Efforts.....           | 8         |
| 1.4.2.3 Impacts on the Bald Eagle, Yuma Clapper Rail, and Cuckoo..... | 9         |
| 1.4.2.4 Mitigation of Impacts on Listed Species .....                 | 9         |
| 1.4.2.5 Impacts on Recreation .....                                   | 9         |
| 1.4.2.6 Impacts on Flood Control.....                                 | 9         |
| 1.4.2.7 Impacts on Water Quality.....                                 | 9         |
| 1.4.2.8 Impacts on Wildlife Habitat.....                              | 9         |
| 1.4.2.9 Impacts on Socioeconomics .....                               | 10        |
| 1.4.3 Issues Selected for Further Consideration.....                  | 10        |
| 1.5 Decisions, Permits, and Approvals .....                           | 10        |
| 1.5.1 Decisions and Actions by FWS.....                               | 10        |
| 1.5.2 Decisions and Actions by SRP.....                               | 11        |
| <b>Chapter 2 Background .....</b>                                     | <b>13</b> |
| 2.1 Description of Applicant and Beneficiaries.....                   | 13        |
| 2.2 Description of SRP Reservoir System and Storage Operations.....   | 15        |
| 2.2.1 Overview .....  | 15        |
| 2.2.2 History .....   | 15        |
| 2.2.3 Salt River Reservoir System .....                               | 18        |
| 2.2.4 Roosevelt Operations.....                                       | 20        |
| 2.2.5 Verde Reservoirs .....  | 24        |
| 2.2.6 Roosevelt Recreation .....                                      | 25        |
| 2.3 History of NEPA Compliance at Roosevelt Lake.....                 | 25        |
| 2.4 History of ESA Compliance at Roosevelt Lake .....                 | 26        |
| 2.4.1 1983/1984.....  | 26        |
| 2.4.2 1989/1990.....  | 27        |
| 2.4.3 1992/1993.....  | 28        |
| 2.4.4 1995/1996.....  | 29        |
| 2.4.5 Summary of Reclamation’s ESA Compliance .....                   | 31        |
| 2.5 Forest Service Consultations .....                                | 31        |

|   |           |
|---|-----------|
| <b>Chapter 3 Alternatives Including the Proposed Action.....</b>  | <b>33</b> |
| 3.1 Introduction.....   | 33        |
| 3.2 Formulation and Evaluation of Alternatives.....   | 33        |
| 3.2.1 Compliance with NEPA and the ESA .....  | 34        |
| 3.2.2 Impacts on Listed and Candidate Species.....  | 34        |
| 3.2.3 Public Input .....  | 35        |
| 3.2.4 Impacts on Water Delivery and Power Generation .....  | 35        |
| 3.2.5 Extent and Feasibility of Minimization and Mitigation<br>Measures .....                                     | 35        |
| 3.2.6 Results of Prior ESA Compliance for Modifications to<br>Roosevelt.....                                      | 36        |
| 3.2.7 FWS Guidance.....   | 36        |
| 3.2.8 Selected Alternatives .....   | 36        |
| 3.3 Alternative 1 — No Permit (No Action by FWS).....   | 37        |
| 3.3.1 Roosevelt Operation .....   | 37        |
| 3.3.2 Actions to Minimize, Mitigate, and Monitor the Effects of<br>Roosevelt Operations.....                      | 38        |
| 3.4 Alternative 2 — Full Operation of Roosevelt (Proposed Action) .....   | 38        |
| 3.4.1 Roosevelt Operation .....   | 39        |
| 3.4.2 Actions to Minimize, Mitigate, and Monitor the Effects of<br>Roosevelt Operations.....                      | 40        |
| 3.4.2.1 Integration with Prior Section 7 Consultations for<br>Modified Roosevelt .....                            | 40        |
| 3.4.2.2 Relationship of the RHCP to the Southwestern<br>Willow Flycatcher Recovery Team’s<br>Recommendation ..... | 42        |
| 3.4.2.3 Minimization and Mitigation Measures .....  | 43        |
| 3.4.2.4 Funding Assurances .....  | 64        |
| 3.4.2.5 Monitoring Measures .....   | 65        |
| 3.4.2.6 Adaptive Management .....   | 66        |
| 3.4.2.7 Additional Assurances (No Surprises) and Changed<br>or Unforeseen Circumstances .....                     | 66        |
| 3.5 Alternative 3 — Re-operation of Roosevelt .....   | 69        |
| 3.5.1 Roosevelt Re-operation.....   | 69        |
| 3.5.2 Options to Minimize, Mitigate, and Monitor the Effects of<br>Roosevelt Re-operation.....                    | 70        |
| 3.6 Alternatives and Mitigation Measures Eliminated from Further<br>Consideration .....                           | 70        |
| 3.6.1 Section 7 Consultation Between Reclamation and FWS .....  | 72        |
| 3.6.2 Breach Roosevelt Dam .....  | 72        |
| 3.6.3 Other Changes in Roosevelt Operations .....   | 73        |
| 3.6.3.1 Reservoir Management to Enhance Riparian Habitat .....  | 73        |
| 3.6.3.2 Various Other Limits for Maximum Reservoir<br>Elevation and Timing of Fill.....                           | 74        |

|  |   |            |
|--|---|------------|
| 3.6.4  | Change Verde River Reservoir Operations.....  | 74         |
| 3.6.4.1  | Modifying the Timing and Extent of Fill .....   | 74         |
| 3.6.4.2  | Releases of Water to Mimic the Natural Hydrograph.....  | 75         |
| 3.6.4.3  | Providing Sediment to the Lower Verde .....   | 77         |
| 3.6.5  | Measures to Minimize or Mitigate Impacts on Listed Species<br>Through Protection or Restoration of Riparian Habitat in the<br>Salt and Verde Watersheds ..... | 78         |
| 3.6.5.1  | Protect Riparian Habitat on Private Land.....   | 78         |
| 3.6.5.2  | Restore Riparian Habitat on Private Land .....  | 79         |
| 3.6.5.3  | Protect and Restore Riparian Habitat on Public Land.....  | 79         |
| 3.6.6  | Measures to Minimize or Mitigate Water Supply Impacts<br>Resulting from Changes in Reservoir Operations .....   | 81         |
| 3.6.6.1  | Additional Ground Water Pumping .....   | 81         |
| 3.6.6.2  | Reduction of Water Use Through Conservation<br>Measures.....  | 83         |
| 3.6.6.3  | Recharge of Water That Cannot be Stored at<br>Roosevelt .....   | 83         |
| 3.6.6.4  | Use of CAP Water.....   | 85         |
| 3.6.6.5  | Use of Effluent .....   | 88         |
| 3.6.6.6  | Acquisition of Water from Other Sources or Water<br>Users.....  | 89         |
| 3.6.7  | Measures to Minimize or Mitigate Power Supply Impacts<br>Resulting from Changes in Reservoir Operations .....   | 90         |
| 3.6.7.1  | Construct New Transmission.....   | 90         |
| 3.6.7.2  | Purchase Replacement Power.....   | 91         |
| 3.6.7.3  | Construct New Power Generation Capacity .....   | 91         |
| 3.6.7.4  | Utilize Renewable Energy .....  | 91         |
| 3.6.7.5  | Increase Energy Conservation .....  | 91         |
| 3.7  | Environmentally Preferred Alternative .....   | 92         |
| 3.7.1  | Alternative 1—No Action by FWS .....  | 92         |
| 3.7.2  | Alternative 2—Full Operation of Roosevelt (Proposed Action).....  | 93         |
| 3.7.3  | Alternative 3—Re-operation of Roosevelt.....  | 93         |
| 3.7.4  | The Environmentally Preferred Alternative.....  | 93         |
| 3.8  | Summary.....  | 94         |
| <b>Chapter 4 Affected Environment and Environmental Consequences .....</b> |   | <b>101</b> |
| 4.1  | Introduction.....   | 101        |
| 4.2  | Water Resources, Flood Control, and Water Quality.....  | 101        |
| 4.2.1  | Affected Environment.....   | 101        |
| 4.2.1.1  | Surface Water.....  | 102        |
| 4.2.1.2  | Ground Water.....   | 103        |
| 4.2.1.3  | Flood Control.....  | 103        |
| 4.2.1.4  | Water Quality.....  | 104        |



|         |   |     |
|---------|---|-----|
| 4.2.2   | Environmental Consequences .....                                | 105 |
| 4.2.2.1 | Effects of No Permit Alternative (Alternative 1).....           | 105 |
| 4.2.2.2 | Effects of Full Operation Alternative (Alternative 2) .....     | 108 |
| 4.2.2.3 | Effects of Re-operation Alternative (Alternative 3).....        | 109 |
| 4.3     | Vegetation.....   | 110 |
| 4.3.1   | Affected Environment.....                                       | 110 |
| 4.3.1.1 | Upland Plant Communities.....                                   | 110 |
| 4.3.1.2 | Riparian Plant Communities.....                                 | 111 |
| 4.3.1.3 | Wetlands .....  | 112 |
| 4.3.2   | Environmental Consequences .....                                | 113 |
| 4.3.2.1 | Effects of No Permit Alternative (Alternative 1).....           | 113 |
| 4.3.2.2 | Effects of Full Operation Alternative (Alternative 2) .....     | 114 |
| 4.3.2.3 | Effects of Re-operation Alternative (Alternative 3).....        | 115 |
| 4.4     | Geology and Soils .....   | 115 |
| 4.4.1   | Affected Environment.....                                       | 115 |
| 4.4.2   | Environmental Consequences .....                                | 116 |
| 4.4.2.1 | Effects of No Permit Alternative (Alternative 1).....           | 116 |
| 4.4.2.2 | Effects of Full Operation Alternative (Alternative 2) .....     | 116 |
| 4.4.2.3 | Effects of Re-operation Alternative (Alternative 3).....        | 116 |
| 4.5     | Wildlife and Aquatic Resources .....                            | 116 |
| 4.5.1   | Affected Environment.....                                       | 116 |
| 4.5.1.1 | General Wildlife.....   | 116 |
| 4.5.1.2 | Forest Service Management Prescriptions .....                   | 117 |
| 4.5.1.3 | Forest Service Management Indicator Species.....                | 117 |
| 4.5.1.4 | Fisheries.....  | 118 |
| 4.5.2   | Environmental Consequences .....                                | 118 |
| 4.5.2.1 | Effects of the No Permit Alternative (Alternative 1).....       | 118 |
| 4.5.2.2 | Effects of Full Operation Alternative (Alternative 2) .....     | 119 |
| 4.5.2.3 | Effects of the Re-operation Alternative<br>(Alternative 3)..... | 120 |
| 4.6     | Endangered, Threatened, Candidate, and Sensitive Species .....  | 121 |
| 4.6.1   | Affected Environment.....                                       | 121 |
| 4.6.1.1 | Southwestern Willow Flycatcher .....                            | 121 |
| 4.6.1.2 | Yuma Clapper Rail.....  | 130 |
| 4.6.1.3 | Bald Eagle.....   | 132 |
| 4.6.1.4 | Yellow-billed Cuckoo .....                                      | 135 |
| 4.6.1.5 | Other Sensitive Wildlife Species of Concern .....               | 139 |
| 4.6.1.6 | Sensitive Plant Species of Concern.....                         | 141 |
| 4.6.2   | Environmental Consequences .....                                | 141 |
| 4.6.2.1 | Impact to Flycatchers .....                                     | 142 |
| 4.6.2.2 | Impact on Yuma Clapper Rails.....                               | 154 |
| 4.6.2.3 | Impact to Bald Eagles.....                                      | 157 |
| 4.6.2.4 | Impact on Cuckoos.....  | 163 |
| 4.6.2.5 | Other Sensitive Wildlife Species of Concern .....               | 166 |
| 4.6.2.6 | Sensitive Plant Species of Concern.....                         | 167 |

|          |  |     |
|----------|--|-----|
| 4.7      | Air Quality .....  | 167 |
| 4.7.1    | Affected Environment.....  | 167 |
| 4.7.2    | Environmental Consequences .....   | 167 |
| 4.7.2.1  | Effects of No Permit Alternative (Alternative 1).....                        | 167 |
| 4.7.2.2  | Effects of Full Operation Alternative (Alternative 2) .....                  | 167 |
| 4.7.2.3  | Effects of Re-operation Alternative (Alternative 3).....                     | 167 |
| 4.8      | Visual Resources .....   | 168 |
| 4.8.1    | Affected Environment.....  | 168 |
| 4.8.2    | Environmental Consequences .....   | 168 |
| 4.8.2.1  | Effects of No Permit Alternative (Alternative 1).....                        | 168 |
| 4.8.2.2  | Effects of Full Operation of Roosevelt (Alternative 2) .....                 | 169 |
| 4.8.2.3  | Re-Operation Alternative (Alternative 3).....                                | 169 |
| 4.9      | Cultural Resources .....   | 169 |
| 4.9.1    | Affected Environment.....  | 170 |
| 4.9.2    | Environmental Consequences .....   | 171 |
| 4.9.2.1  | Effects of No Permit Alternative (Alternative 1).....                        | 171 |
| 4.9.2.2  | Effects of Full Operation Alternative (Alternative 2) .....                  | 171 |
| 4.9.2.3  | Effects of Re-operation Alternative (Alternative 3).....                     | 171 |
| 4.10     | Land Use and Land Ownership.....   | 172 |
| 4.10.1   | Affected Environment.....  | 172 |
| 4.10.1.1 | Recreation .....   | 174 |
| 4.10.1.2 | Residential and Commercial.....  | 174 |
| 4.10.1.3 | Grazing .....  | 174 |
| 4.10.2   | Environmental Consequences .....   | 174 |
| 4.10.2.1 | Effects of No Permit Alternative (Alternative 1).....                        | 174 |
| 4.10.2.2 | Effects of Full Operation Alternative (Alternative 2) .....                  | 174 |
| 4.10.2.3 | Effects of Re-operation Alternative (Alternative 3).....                     | 175 |
| 4.11     | Recreation .....   | 175 |
| 4.11.1   | Affected Environment.....  | 175 |
| 4.11.1.1 | Water-Based Recreation .....   | 175 |
| 4.11.1.2 | Camping.....   | 175 |
| 4.11.1.3 | Wildlife Viewing and Sightseeing .....                                       | 176 |
| 4.11.1.4 | Upgraded and Expanded Recreation Resources Under<br>Reclamation Plan 6 ..... | 176 |
| 4.11.1.5 | Visitor Use .....  | 179 |
| 4.11.2   | Environmental Consequences .....   | 179 |
| 4.11.2.1 | Effects of No Permit Alternative (Alternative 1).....                        | 180 |
| 4.11.2.2 | Effects of Full Operation Alternative (Alternative 2) .....                  | 180 |
| 4.11.2.3 | Effects of Re-operation Alternative (Alternative 3).....                     | 181 |
| 4.12     | Socioeconomics .....   | 181 |
| 4.12.1   | Affected Environment.....  | 181 |
| 4.12.1.1 | Population .....   | 181 |
| 4.12.1.2 | Employment and Income .....  | 181 |
| 4.12.1.3 | Housing.....   | 182 |
| 4.12.1.4 | Water Use and Hydropower Generation .....                                    | 182 |
| 4.12.1.5 | Recreation .....   | 183 |

|   |            |
|---|------------|
| 4.12.2 Environmental Consequences .....   | 183        |
| 4.12.2.1 Water Supply .....   | 183        |
| 4.12.2.2 Hydropower Generation .....  | 185        |
| 4.12.2.3 Recreation .....   | 187        |
| 4.12.2.4 Acquisition of Mitigation Properties .....   | 189        |
| 4.12.2.5 Environmental Justice .....  | 190        |
| 4.13 Cumulative Effects .....   | 190        |
| 4.13.1 Water Resources, Flood Control, and Water Quality .....                                      | 191        |
| 4.13.2 Vegetation .....   | 191        |
| 4.13.3 Wildlife .....   | 192        |
| 4.13.4 Endangered, Threatened, Candidate, and Sensitive Species .....                               | 192        |
| 4.13.5 Visual Resources .....   | 193        |
| 4.13.6 Cultural Resources .....   | 194        |
| 4.13.7 Land Use and Land Ownership .....  | 194        |
| 4.13.8 Recreation .....   | 194        |
| 4.13.9 Socioeconomics .....   | 194        |
| 4.14 Unavoidable Adverse Effects .....  | 195        |
| 4.14.1 No Permit Alternative (Alternative 1) .....  | 195        |
| 4.14.2 Full Operation Alternative (Alternative 2) .....   | 195        |
| 4.14.3 Re-Operation Alternative (Alternative 3) .....   | 196        |
| 4.15 Relationship of Short-Term uses and Long-Term Productivity .....                               | 196        |
| 4.15.1 No Permit Alternative (Alternative 1) .....  | 196        |
| 4.15.2 Full Operation Alternative (Alternative 2) .....   | 196        |
| 4.15.3 Re-Operation Alternative (Alternative 3) .....   | 196        |
| 4.16 Irreversible and Irrecoverable Commitments of Resources .....                                  | 197        |
| 4.16.1 No Permit Alternative (Alternative 1) .....  | 197        |
| 4.16.2 Full Operation Alternative (Alternative 2) .....   | 197        |
| 4.16.3 Re-Operation Alternative (Alternative 3) .....   | 197        |
| <b>Chapter 5 List of Preparers and Recipients of the Draft Environmental Impact Statement .....</b> | <b>199</b> |
| 5.1 Preparers and Contributors .....  | 199        |
| 5.2 EIS Recipients .....  | 201        |
| 5.2.1 Federal, State, and Local Agencies and Indian Tribes .....                                    | 201        |
| 5.2.2 Federal and State Legislators .....   | 202        |
| 5.2.3 Organizations .....   | 202        |
| <b>Chapter 6 References .....</b>   | <b>205</b> |

## TABLES

|  |    |
|--|----|
| Table 1. Reclamation reasonable and prudent alternative, measures, and terms and conditions for the flycatcher at Roosevelt and status of implementation ..... | 29 |
| Table 2. Comparison of flycatcher recovery recommendations and RHCP conservation measures .....  | 44 |

|  |     |
|--|-----|
| Table 3. Existing and proposed minimization and mitigation sites for flycatchers, Yuma clapper rails, bald eagles, and cuckoos. ....                       | 46  |
| Table 4. Roosevelt mitigation schedule (all values in estimated acres). ....   | 50  |
| Table 5. Overview of minimization and mitigation measures. ....  | 54  |
| Table 6. Flycatcher, Yuma clapper rail, and cuckoo monitoring schedule.....  | 66  |
| Table 7. Changed circumstances and conservation or mitigation measures to be implemented.....  | 68  |
| Table 8. Alternatives eliminated from further consideration (retained alternatives noted where applicable). ....   | 70  |
| Table 9. Summary comparison of alternatives and impacts. ....  | 94  |
| Table 10. Annual precipitation in the upper Salt River watershed.....  | 102 |
| Table 11. Comparison of Roosevelt maximum elevation, surface area, and storage capacities by alternative.....  | 106 |
| Table 12. Comparison of average changes in surface water deliveries, ground water pumping, spills, and reservoir storage (1,000s of AF). <sup>†</sup> .... | 106 |
| Table 13. Tonto National Forest management indicator species for the Roosevelt area. ....  | 118 |
| Table 14. Threatened, endangered, and candidate wildlife species at Roosevelt. ....  | 121 |
| Table 15. Occupancy and nesting results for bald eagles near Roosevelt Lake for the years 1991 to 2001.....  | 134 |
| Table 16. AGFD's cuckoo detections by habitat type during 1998-1999 surveys in Arizona by AGFD and USGS.....   | 136 |
| Table 17. Potentially suitable cuckoo habitat at Roosevelt in 2001.....  | 139 |
| Table 18. Other sensitive wildlife and species of concern near Roosevelt.....  | 140 |
| Table 19. Sensitive plant species of concern near Roosevelt.....   | 141 |
| Table 20. Roosevelt Lake recreation site capacities.....   | 178 |
| Table 21. Top five employment sectors and corresponding percentage of workforce.....   | 182 |
| Table 22. Employment Statistics Table .....  | 182 |
| Table 23. Recreation use values for camping, motor boating and fishing.....  | 188 |

## FIGURES

|   |    |
|---|----|
| Figure 1. Vicinity Map, Roosevelt Lake near Phoenix, Arizona. ....  | 2  |
| Figure 2. Comparison of Roosevelt Storage Under Median Inflows, Actual Storage, and Previous Drought of Record (SRP's Storage and Pumping Planning Diagram). .... | 6  |
| Figure 3. Regional Map Showing Power Service Area. ....   | 14 |
| Figure 4. SRP Reservoir System and Water Service Area. ....   | 16 |
| Figure 5. Profile of SRP Water Storage System. ....   | 18 |
| Figure 6. Annual Ground Water Pumping and CAP Water Use.....  | 21 |

|   |     |
|---|-----|
| Figure 7. Historical Roosevelt Elevations, 1951 through April 2001. Note:<br>Historical elevations dating back to 1911 are shown in Figure 4 of<br>Appendix 3 of the RHCP. .... | 23  |
| Figure 8. Locations of Proposed Mitigation Sites. ....  | 45  |
| Figure 9. Minimization and Mitigation Sites on the Salt Arm of Roosevelt. ....  | 56  |
| Figure 10. Comparison of average monthly spills by alternative (AF) at Granite<br>Reef. <sup>†</sup> .....  | 108 |
| Figure 11. Reported Southwestern Willow Flycatcher Nesting Sites in Arizona,<br>2000 .....  | 122 |
| Figure 12. 2001 Tall Dense Vegetation, Salt Arm. ....   | 126 |
| Figure 13. 2001 Tall Dense Vegetation, Tonto Arm. ....  | 127 |
| Figure 14. Acreage of tall dense vegetation at Roosevelt Lake by elevation in<br>2001. ....   | 128 |
| Figure 15. WIFL Territories and Individuals at Roosevelt Lake, 1993 to 2001. ....   | 128 |
| Figure 16. Distribution of flycatcher nests and territories at Roosevelt by<br>elevation, 2000 and 2001. ....   | 129 |
| Figure 17. Bald eagle breeding locations within 100 miles of Roosevelt Lake as<br>of the year 2001. ....  | 135 |
| Figure 18. Detections of Yellow-billed Cuckoo in Arizona, 1998 and 1999<br>Breeding Seasons. ....   | 137 |
| Figure 19. Acres of Occupied Flycatcher Habitat Extrapolated to 2004. ....  | 149 |
| Figure 20. Land Ownership Map. ....   | 173 |
| Figure 21. Recreation Sites at Roosevelt Lake. ....   | 177 |
| Figure 22. Estimated Value of Hydropower (\$/MWh) for the Period October<br>2002 through September 2003. ....   | 187 |

## **Glossary**

## **Index**

## **Appendix A: Status Definitions**

# EXECUTIVE SUMMARY

## Introduction

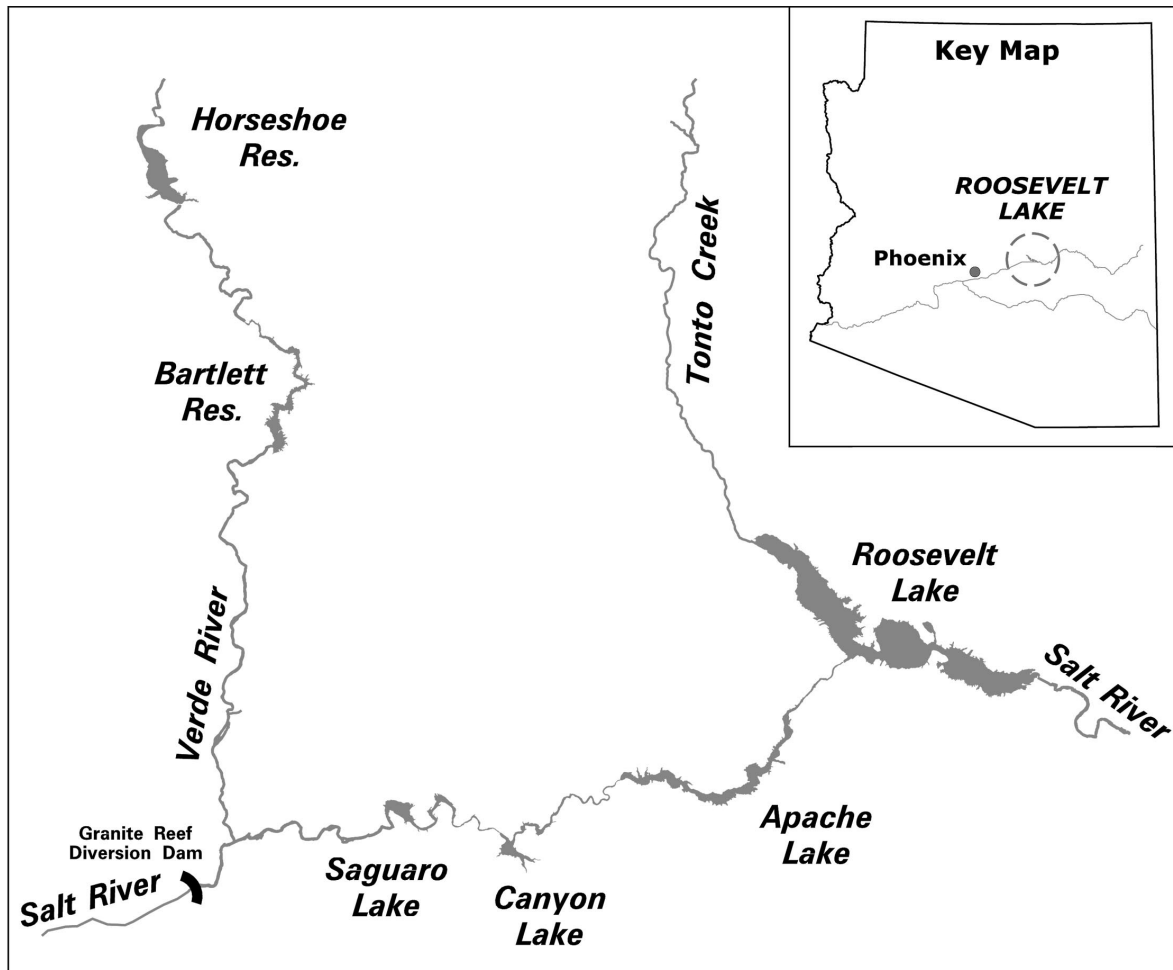
The Salt River Project (SRP) has applied to the U.S. Fish and Wildlife Service (FWS) for a permit pursuant to Section 10(a)(1)(B) of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended. As part of the permit application, SRP has developed and would implement the Roosevelt Habitat Conservation Plan (RHCP) to meet the requirements of a Section 10(a)(1)(B) permit. FWS is issuing this draft Environmental Impact Statement (DEIS) to evaluate the potential impacts associated with issuance of an incidental take permit (ITP) and implementation of the RHCP, and to evaluate alternatives. The RHCP is a companion document to this DEIS and provides additional information that is not contained in the DEIS.

The permit application is for incidental take of federally listed species protected under the Endangered Species Act (ESA) including the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher) and Yuma clapper rail (*Rallus longirostris yumanensis*), and threatened bald eagle (*Haliaeetus leucocephalus*). The candidate yellow-billed cuckoo (*Coccyzus americanus*) (cuckoo) also is addressed should it be listed in the future. The activity that would be covered by the permit is the continued operation by SRP of the existing Roosevelt Dam and Lake (Roosevelt) near Phoenix, Arizona (Figure ES-1). The area covered by the permit would include Roosevelt up to an elevation of 2,151 feet. The requested duration of the permit is 50 years.

The RHCP provides measures to minimize and mitigate incidental take of flycatchers, Yuma clapper rails, bald eagles, and cuckoos to the maximum extent practicable, and which ensures that incidental take will not appreciably reduce the likelihood of the survival and recovery of these species in the wild. The primary mitigation provided by the RHCP is off-site riparian habitat acquisition and management of that habitat in perpetuity. Other measures include protection and management of habitat at Roosevelt, and off-site acquisition of water rights and buffers to benefit riparian habitat acquired as part of the RHCP.

Three alternatives are considered in this DEIS, including a no action alternative (No Permit alternative). The FWS preferred alternative is issuance of an ITP to allow continued operation of Roosevelt up to the maximum elevation of 2,151 feet (Full Operation alternative), in conjunction with SRP's implementation of the RHCP. The Re-Operation alternative would involve FWS issuance of a permit authorizing the modified operation of Roosevelt in order to reduce the short-term impact of reservoir operations on listed and candidate species. Like the Full Operation alternative, the Re-operation alternative would include measures to minimize and mitigate the take of federally listed species.

**Figure ES-1. Vicinity Map, Roosevelt Lake near Phoenix, Arizona.**



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## Background

Roosevelt is operated by SRP in conjunction with three other reservoirs on the Salt River and two reservoirs on the Verde River. All six reservoirs are integral features of the Salt River Reclamation Project, authorized by the Reclamation Act of 1902. SRP operates the reservoirs pursuant to a 1917 contract with the United States. Since completion in 1911, Roosevelt has provided water for power generation, irrigation, municipal and other uses. Currently, SRP reservoirs supply water to more than 1.6 million people in the cities of Phoenix, Mesa, Chandler, Tempe, Glendale, Gilbert, Scottsdale, Tolleson, and Avondale. In addition, water is provided to irrigate agricultural lands and for other uses within the SRP service area. Also, water is delivered to the Salt River Pima-Maricopa Indian Community, Fort McDowell Indian Community, Gila River Indian Community, Buckeye Irrigation Company, Roosevelt Irrigation District, Roosevelt Water Conservation District, and others. Roosevelt and the other SRP reservoirs also provide a variety of recreational uses and environmental benefits in central Arizona such as wildlife habitat and “clean” energy.

Roosevelt Lake has 71 percent of the total storage capacity in the SRP reservoir system. Roosevelt is the cornerstone of SRP's system of six reservoirs that function to supply water and power to the Phoenix metropolitan area. SRP's flexibility in operating Roosevelt is affected by, among other things: 1) SRP's legal obligations to deliver water stored at Roosevelt to its shareholders, cities, irrigation districts, Indian communities, and individual water users pursuant to numerous water rights and contracts; and 2) the capacity of dam outlet works and spillways.

The proposed action is FWS approval of SRP's application for a Section 10 permit for incidental take of the federally listed endangered southwestern willow flycatcher and Yuma clapper rail, the threatened bald eagle, and the candidate yellow-billed cuckoo should it become listed in the future. The permit would allow approved incidental take associated with SRP's filling of the reservoir conservation storage space and continued operation of Roosevelt, consistent with its purpose for water storage and power generation. The RHCP would comply with the ESA and provide for the long-term protection and conservation of listed and candidate species. One of the goals of Section 10, in addition to providing a regulatory mechanism to permit the incidental take of federally listed species by non-Federal entities, is to encourage partnerships among the public, municipal, state, and Federal agencies in the interests of endangered and threatened species and habitat conservation. Thus, the RHCP was developed by SRP in consultation with the FWS, Arizona Game and Fish Department, U.S. Bureau of Reclamation (Reclamation), local municipalities, and other interested parties.

The need for the proposed action is to address future impacts of reservoir operation on the habitat that has flourished on the Roosevelt lakebed due to low water levels resulting from recent years of drought. Species that use riparian habitat have followed the vegetation growth and now occupy areas within the reservoir. In particular, a population of flycatchers now occupies habitat within the storage space at Roosevelt. Thus, periodic refilling of the reservoir may adversely affect habitat used by the flycatcher, as well as the Yuma clapper rail, bald eagle and cuckoo.

## **Alternatives**

The development of alternatives involved input from an Advisory Group and public scoping. All of the significant alternatives and issues raised during the scoping process are addressed in the DEIS. Three alternatives were selected by FWS and SRP for further evaluation:

- **No Permit Alternative (No Action by FWS)** — No issuance of a Section 10 Permit (ITP) by FWS. Under this alternative, SRP would do everything within its control to avoid any take of federally listed species associated with its continued operation of Roosevelt.
- **Full Operation Alternative (Proposed Action)** — Issuance of an ITP by FWS allowing the continued operation of Roosevelt by SRP consistent with pre-permit operational objectives for full operation of the reservoir up to the maximum storage elevation of 2,151 feet. This alternative includes implementation of the RHCP measures to minimize or mitigate the potential take of federally listed species.



- **Re-operation Alternative** — Issuance of an ITP by FWS authorizing the modified operation of Roosevelt to reduce the short-term impact of reservoir operations on listed and candidate species. This alternative includes measures to minimize or mitigate the potential take of federally listed species.

The RHCP includes measures to be undertaken by SRP to mitigate potential effects on listed and candidate species for the Full Operation and Re-operation alternatives. The RHCP measures also complement mitigation being implemented by Reclamation as a result of previous Biological Opinions (BOs) issued pursuant to Section 7 of the ESA. These BOs were issued based on Reclamation's modifications of Roosevelt Dam, which increased the water conservation storage space from elevation 2,136 to 2,151 feet and provided flood control space up to 2,218 feet.

The Full Operation alternative and the RHCP involve SRP's operation of all conservation space in Roosevelt including the new conservation space created by Reclamation's construction of modifications. The operation of Roosevelt flood control space above elevation 2,151 feet is not covered by the RHCP because it is subject to regulations issued by the U.S. Army Corps of Engineers.

Many other alternatives were eliminated from further consideration because they are infeasible, would not meet project purposes, or are minor variations of the alternatives considered in detail. These alternatives include consultation between Reclamation and FWS pursuant to Section 7 of the ESA, other changes in operation of SRP's Salt and Verde reservoirs, and other measures to minimize or mitigate impacts on listed species, water supply, and power generation.

### Potential Environmental Impacts

For each of the three alternatives, an evaluation was made of the potential effects to natural, cultural and socioeconomic resources. Those impacts are summarized in Table ES-1.

**Table ES-1. Summary comparison of alternatives and impacts.**

| Impact Topic | Alternative 1<br>No Permit<br>No Action by FWS   | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation of<br>Roosevelt   |
|--------------|--|--|---|
| VEGETATION   | Shift from riparian vegetation to desert scrub and riverine riparian within the Roosevelt lakebed. | Fluctuating amount of riparian vegetation depending on lake levels. Conversion of up to 75 acres of agricultural land or upland vegetation to riparian vegetation and minor disturbance for ditch and road work at Roosevelt mitigation sites. | Shift from riparian to desert scrub at upper elevations. Conversion of up to 75 acres of agricultural land or upland vegetation to riparian vegetation and minor disturbance for ditch and road work at Roosevelt mitigation sites. |

| Impact Topic   | Alternative 1<br>No Permit<br>No Action by FWS  | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation of<br>Roosevelt   |
|--|---|--|---|
| <b>WETLANDS</b>                                      | Less wetland area on average.   | No net change in wetland area.   | Slightly less wetland area on average.  |
| <b>THREATENED, ENDANGERED, AND SENSITIVE SPECIES</b> | <p>Flycatcher—No short-term effect, but long-term reduction of habitat is likely, with a decrease in productivity. No conservation measures would be implemented.</p> <p>Yuma clapper rail—No reduction in habitat or productivity.</p> <p>Bald Eagle—Existing nest trees would not be lost from inundation, but may be lost due to drying. Prey availability of fish would decrease, but waterfowl may be more available. Interspecific competition between breeding areas may increase. Long-term decrease in bald eagle productivity with a smaller reservoir. No new conservation measures.</p> <p>Cuckoos—No effect on existing cuckoo habitat, but long-term reduction of habitat is likely, with a decrease in productivity.</p> <p>Sensitive Species—No effect.</p> | <p>Flycatcher—Anticipated periodic losses of up to 750 acres of occupied habitat due to inundation or desiccation. On average 400 acres of habitat would be available, but a decrease in productivity is likely with periodic losses of habitat. Multiple conservation measures, including 3:1 mitigation for impacted habitat would offset adverse effects.</p> <p>Yuma clapper rail—Anticipated periodic losses of up to 5 acres of occupied habitat due to inundation, with a decrease in productivity. Mitigation for impacted habitat would offset adverse effects.</p> <p>Bald Eagle—Potential inundation of Pinto and Tonto nest sites. Prey availability of fish and waterfowl would be maintained. Interspecific competition between breeding areas is less likely with larger reservoir. Additional conservation measures would reduce potential effects.</p> <p>Cuckoo—Periodic losses of about 313 acres of habitat anticipated. Over the long-term, habitat and productivity would fluctuate annually. Conservation measures for flycatchers would benefit cuckoos.</p> <p>Sensitive Species—No effect.</p> | <p>Flycatcher—Anticipated periodic losses of up to 250 acres of occupied habitat due to inundation or desiccation, with a decrease in productivity. Multiple conservation measures similar to Alternative 2 would be implemented.</p> <p>Yuma clapper rail—Same impacts and mitigation as Alternative 2.</p> <p>Bald eagle—Existing nest trees would not be lost from inundation, but may be lost due to drying. Foraging opportunities similar to current conditions. Interspecific competition between breeding areas would be slightly greater than Alternative 2. Conservation measures would be similar to Alternative 2.</p> <p>Cuckoo—Periodic loss of about 60 acres of habitat anticipated. Over the long-term habitat and productivity would fluctuate annually. Conservation measures for flycatchers would benefit cuckoos.</p> <p>Sensitive Species—No effect.</p> |

| <b>Impact Topic</b>  | <b>Alternative 1<br/>No Permit<br/>No Action by FWS</b>  | <b>Alternative 2<br/>Full Operation of<br/>Roosevelt<br/>(Proposed Action)</b>   | <b>Alternative 3<br/>Re-operation of<br/>Roosevelt</b>   |
|--|--|--|--|
| <b>WILDLIFE AND<br/>AQUATIC<br/>RESOURCES</b>                            | Upland wildlife would benefit; riparian and aquatic wildlife would be adversely affected. Increase in spills may affect riparian and aquatic habitat on the Salt River. Lower Verde reservoir lake levels may reduce the quality of aquatic habitat.   | No effect on upland wildlife. Effects to riparian and aquatic wildlife would vary annually. Provides greatest amount of habitat for deep and shallow water fisheries. At Roosevelt mitigation site, upland species would lose habitat and riparian species would gain habitat. Mitigation measures would benefit wildlife and aquatic resources. | Slight benefit to upland wildlife. Riparian and aquatic wildlife would be slightly harmed. At Roosevelt mitigation site, upland species would lose habitat and riparian species would gain habitat. Increase in spills may affect riparian and aquatic habitat on the Salt River. Lower Verde reservoir lake levels may reduce the quality of aquatic habitat. Mitigation measures would benefit wildlife and aquatic resources. |
| <b>WATER<br/>RESOURCES,<br/>FLOOD CONTROL,<br/>AND WATER<br/>QUALITY</b> | Reduction in average annual SRP deliveries of 82,000 AF and City deliveries of 49,000 AF. SRP ground water pumping to increase 66,000 AF/year (cannot be used by Cities). Salt and Verde reservoir spills would increase 419,000 AF/year. Additional spills would slightly dilute downstream effluent. Increased flood flows would increase turbidity and sedimentation. | No change in storage capacity or SRP and City water supply; no changes in flood control or water quality.  | Reduction in average annual SRP deliveries of 25,000 AF and City deliveries of 49,000 AF. SRP ground water pumping to increase 14,000 AF/ year (cannot be used by Cities). Salt and Verde reservoir spills would increase 86,000 AF/year. Additional spills would slightly dilute downstream effluent. Increased flood flows would increase turbidity and sedimentation.   |
| <b>VISUAL<br/>RESOURCES</b>  | Less surface water area at Roosevelt and greater exposed shoreline. No impact to VQO. Visual quality would be reduced slightly at Horseshoe and Bartlett reservoirs.   | No change to visual quality. No impact to VQO. Acquisition, protection, and creation of riparian habitat at mitigation sites would have a long-term positive impact.   | Visual quality would be similar to existing conditions. No impact to VQO. Visual quality at Bartlett and Horseshoe reservoirs would be reduced slightly. Acquisition, protection, and creation of riparian habitat at mitigation sites would have a long-term positive impact.   |

| <b>Impact Topic</b>       | <b>Alternative 1<br/>No Permit<br/>No Action by FWS</b>  | <b>Alternative 2<br/>Full Operation of<br/>Roosevelt<br/>(Proposed Action)</b>  | <b>Alternative 3<br/>Re-operation of<br/>Roosevelt</b>   |
|---------------------------|--|---|--|
| <b>CULTURAL RESOURCES</b> | Previously inundated cultural resources sites subject to degradation and vandalism.  | No change to cultural resources. No adverse impacts to Roosevelt or other mitigation sites are anticipated.   | Previously inundated cultural resources sites subject to degradation and vandalism.  |
| <b>LAND USE</b>           | No direct change in land use.  | No change in land use at Roosevelt. Acquisition of mitigation sites would preserve land in a natural condition, but may eliminate grazing, agriculture or other land practices.   | Similar to Alternative 2.  |
| <b>RECREATION</b>         | A 30% reduction in reservoir area would reduce boating, fishing, and recreation opportunities.   | Recreation use would vary with water levels similar to current conditions.  | A 10% reduction in reservoir area surface area would reduce boating, fishing, and recreation opportunities.  |
| <b>SOCIOECONOMICS</b>     | <p>Water Supply—The cost to SRP and the Cities to replace lost water supplies would be about \$1.8 billion over 50 years if sources can be found. Local residents and businesses would be impacted by increased water supply costs.</p> <p>Hydropower—Lost power production would have a value of about \$41 million over 50 years. Consumer cost for power may increase.</p> <p>Recreation—Direct loss in revenue about \$96 million over 50 years. Recreation related businesses would be impacted.</p> <p>Environmental Justice—Minority and low income populations would not be disproportionately affected.</p> | <p>Water Supply—No impact to water supply costs.</p> <p>Hydropower—No change in hydropower production.</p> <p>Recreation—No change in recreation related economy.</p> <p>Environmental Justice—Same as Alternative 1.</p> | <p>Water Supply—The cost to SRP and the Cities to replace lost water supplies would be about \$1 billion over 50 years if sources can be found. Local residents and businesses would be impacted increased water supply costs.</p> <p>Hydropower—Lost power production would have a value of about \$25 million over 50 years. Consumer cost for power may increase.</p> <p>Recreation—Direct loss in revenue about \$32 million over 50 years. Recreation related businesses would be impacted.</p> <p>Environmental Justice—Same as Alternative 1.</p> |



# Chapter 1

## Purpose and Need

### 1.1 Introduction

The U.S. Fish and Wildlife Service (FWS) has received an application for an incidental take permit (ITP) under Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended, and a draft habitat conservation plan from the Salt River Project (SRP) to address the incidental take of federally listed species and the impacts on candidate species associated with SRP's continued operation of Theodore Roosevelt Dam and Lake (Roosevelt) to store and release water (Figure 1).<sup>1</sup> If the ITP application is approved, SRP will implement the Roosevelt Habitat Conservation Plan (RHCP) in fulfillment of requirements of the ESA. The RHCP provides measures to minimize and mitigate, to the maximum extent practicable, the effects of Roosevelt operation on listed and candidate species and their habitat and to ensure that any take of listed species will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

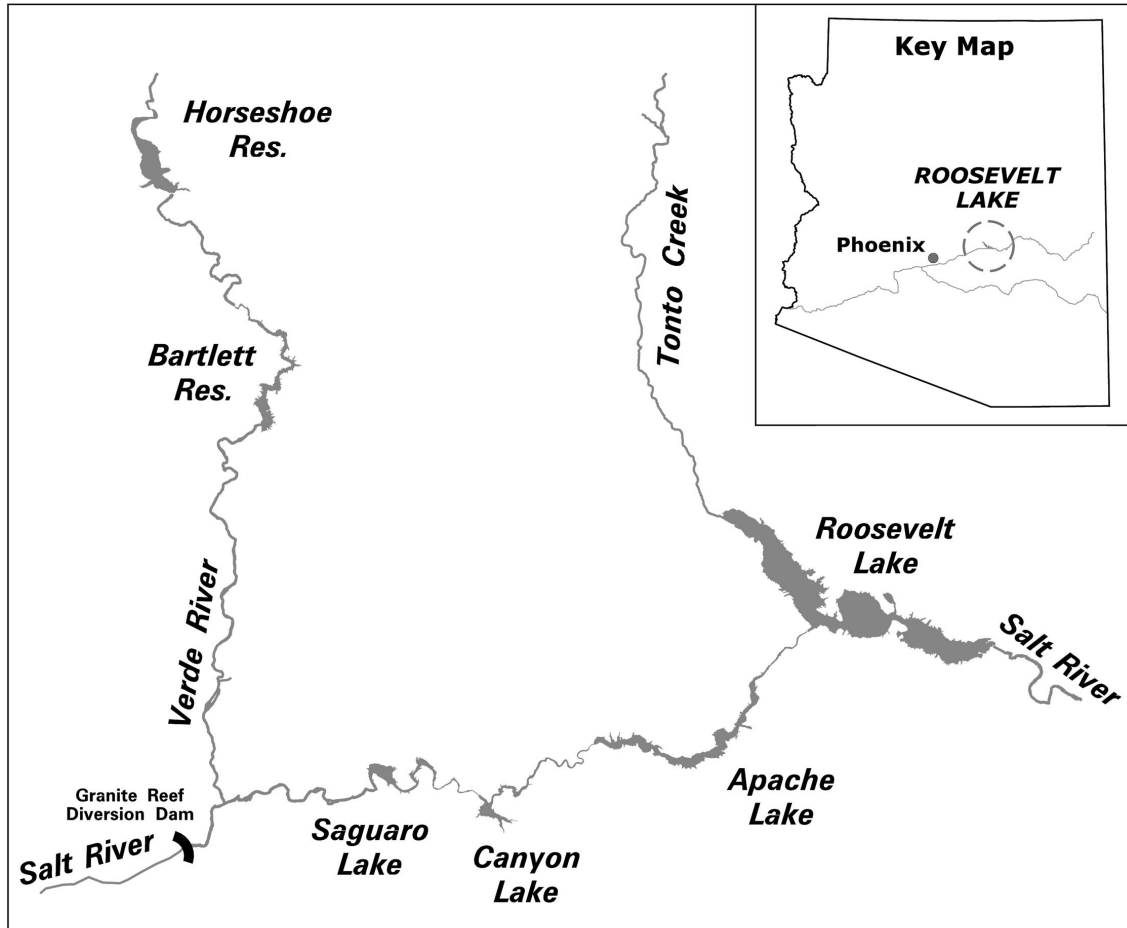
This draft Environmental Impact Statement (EIS) the draft RHCP address three federally listed and one candidate species present at Roosevelt. Federally listed threatened and endangered species are protected under the ESA. Southwestern willow flycatchers (*Empidonax traillii extimus*) (flycatchers) were listed as an endangered species on February 27, 1995 (60 FR 10693) and are currently nesting in the Roosevelt lakebed. Yuma clapper rails (*Rallus longirostris yumanensis*) were listed as an endangered species on March 11, 1967 (32 FR 4001) and were recently observed at Roosevelt in a small area of potentially suitable habitat. Threatened bald eagles (*Haliaeetus leucocephalus*) nest and forage at Roosevelt and nearby locations.<sup>2</sup> Yellow-

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<sup>1</sup> A "listed" species is a species that has been federally listed as threatened or endangered by the FWS (*see* 16 U.S.C. § 1533(a)). "Candidate" species are "... those species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species" (50 C.F.R. §§ 17.22 and 17.32). In the event that a candidate species covered by an HCP is listed, the ITP would authorize incidental take of the species.

<sup>2</sup> In 43 states including Arizona, bald eagles were listed as endangered in 1978; in five other states, bald eagles were listed as threatened (43 FR 6233, February 14, 1978). A recovery plan was established in 1982 for the Southwest population. Bald eagles were downlisted to a threatened species in the lower 48 states in 1995 (60 FR 35999, July 12, 1995).

**Figure 1. Vicinity Map, Roosevelt Lake near Phoenix, Arizona.**



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billed cuckoos (*Coccyzus americanus*) (cuckoos) are candidate species for Federal listing with potentially suitable habitat at Roosevelt.<sup>3</sup> Currently, there is no critical habitat designation for any of the federally listed species. Continued on-going operation of Roosevelt is expected to result in periodic filling of the reservoir, which would inundate portions or all of the habitat recently colonized by flycatchers and habitat used by Yuma clapper rails, bald eagles, and cuckoos.

The proposed action by SRP is the continued operation of the entire conservation storage space in Roosevelt up to an elevation of 2,151 feet. Under this alternative, SRP would optimize the operation of Roosevelt consistent with its original purpose as a water storage and power generation facility. Roosevelt operation would be in accordance with the Modified Roosevelt Dam Operating Agreement (see Section 2.2.4), which minimizes

<sup>3</sup> Cuckoos were added to the FWS candidate species list in 2001 (66 FR 38611, July 25, 2001).

the spill of water past Granite Reef Dam. SRP also proposes to periodically clear dead trees on the lakebed if safety and operational concerns arise.

Operation of flood control space above an elevation of 2,151 feet is not covered by the EIS or the proposed RHCP. Flood control operations at Roosevelt are the responsibility of the Army Corps of Engineers and are not at the discretion of SRP.

### **1.1.1 Relationship Between the EIS and the RHCP**

Section 9 of the ESA prohibits the “take” of any fish or wildlife species listed as threatened or endangered under the ESA, unless specifically authorized by regulation. Take, as defined by the ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct” (16 U.S.C. § 1531(18)). Amendments to the ESA in 1982 provide for the issuance of permits authorizing the “incidental take” of endangered or threatened species of wildlife by non-Federal entities. Incidental take is defined by the ESA as take that is “incidental to, and not the purpose of, the carrying out of an otherwise lawful activity” (50 CFR 17.22 and 17.32). The “incidental take permit” process was established under Section 10(a)(1)(B) of the ESA.

Section 10(a)(1)(B) of the ESA (Section 10) requires an applicant for an ITP to submit a conservation plan that specifies, among other things, the impacts that are likely to result from the taking and the measures the permit applicant will undertake to minimize and mitigate such impacts. Conservation plans under the ESA are referred to as “habitat conservation plans” or “HCPs.” SRP prepared and submitted the RHCP to the FWS in July 2002 (SRP 2002c). The RHCP addresses: alternatives that were considered; potential impacts to federally threatened, endangered, and candidate species; measures to minimize and mitigate impacts; and the methods to implement and fund the RHCP.

The issuance of an ITP is a Federal action subject to National Environmental Policy Act (NEPA) compliance. The purpose of the NEPA process is to promote analysis and disclosure of the environmental issues surrounding a proposed Federal action in order to reach a decision that reflects NEPA’s mandate to strive for harmony between human activity and the natural world. Although Section 10 and NEPA requirements overlap considerably, the scope of NEPA goes beyond that of the ESA by considering the impacts of a Federal action on a wider variety of resources, such as water quality, visual resources, cultural resources, and land use. An EIS is prepared when the proposed activity under the HCP is a major Federal action significantly affecting the quality of the human environment. This EIS has been prepared to evaluate the potential for significant adverse impacts to the environment from:

- Approving the requested authorization for incidental take of the endangered southwestern willow flycatcher, Yuma clapper rail, and the threatened bald eagle
- Loss of habitat for the candidate yellow-billed cuckoo, and incidental take if the cuckoo is listed in the future
- Implementing the RHCP

This Draft EIS analyzes three alternatives including: 1) no action (no ITP); 2) FWS approval of the application for an ITP and the associated RHCP for current ongoing



operation of Roosevelt; and 3) FWS approval of an ITP involving re-operation of Roosevelt. For each of these alternatives, the potential impacts on natural, cultural, and socioeconomic resources were evaluated. This document has been prepared in accordance with NEPA requirements and the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500-1508). The FWS is the lead agency for preparation of the EIS.

### **1.1.2 Document Organization**

Chapter 1 provides information on the purpose and need for the proposed action, the scoping process, and significant issues that were identified for further analysis. The last section of Chapter 1 describes the decisions, permits, and approvals associated with the EIS and RHCP. Chapter 2 provides supporting background material on SRP and the current operation of Roosevelt Lake and the history of ESA compliance at Roosevelt. Chapter 3 describes SRP's proposal to implement the RHCP and other alternatives that were considered. In addition, information on alternatives that were excluded from further consideration and the environmentally preferred alternative are included in Chapter 3. Baseline information on natural, cultural, and socioeconomic resources is provided in Chapter 4 along with an analysis of the potential environmental consequences for each of the alternatives. Remaining chapters provide information on preparers and recipients of the EIS and references.

## **1.2 Purpose of the Proposed Action**

The proposed action is FWS approval of the application for a permit for incidental take of the federally listed endangered southwestern willow flycatcher and Yuma clapper rail, the threatened bald eagle, and the candidate yellow-billed cuckoo should it become listed in the future. The permit would allow approved incidental take associated with SRP's filling of the reservoir conservation storage space and continued operation of Roosevelt, consistent with its purpose for water storage and power generation. The permit would also allow SRP to clear dead trees if necessary to alleviate safety and operational concerns. The RHCP would comply with the ESA and provide for the long-term protection and conservation of listed and candidate species.

Section 10(a)(1)(B) of the ESA and regulations at 50 CFR 17.22 and 17.32 contain provisions for issuing permits to non-Federal entities for the take of endangered and threatened species, provided the following criteria are met:

1. The taking will be incidental to an otherwise lawful activity;
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided;
4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and

5. The applicant agrees to implement other measures that FWS may require as being necessary or appropriate for the purposes of the HCP.

The RHCP was developed to satisfy these criteria. The goal and objective of the RHCP is to provide for the conservation of federally listed and candidate species that inhabit Roosevelt while allowing the continued operation of Roosevelt. This would be accomplished by:

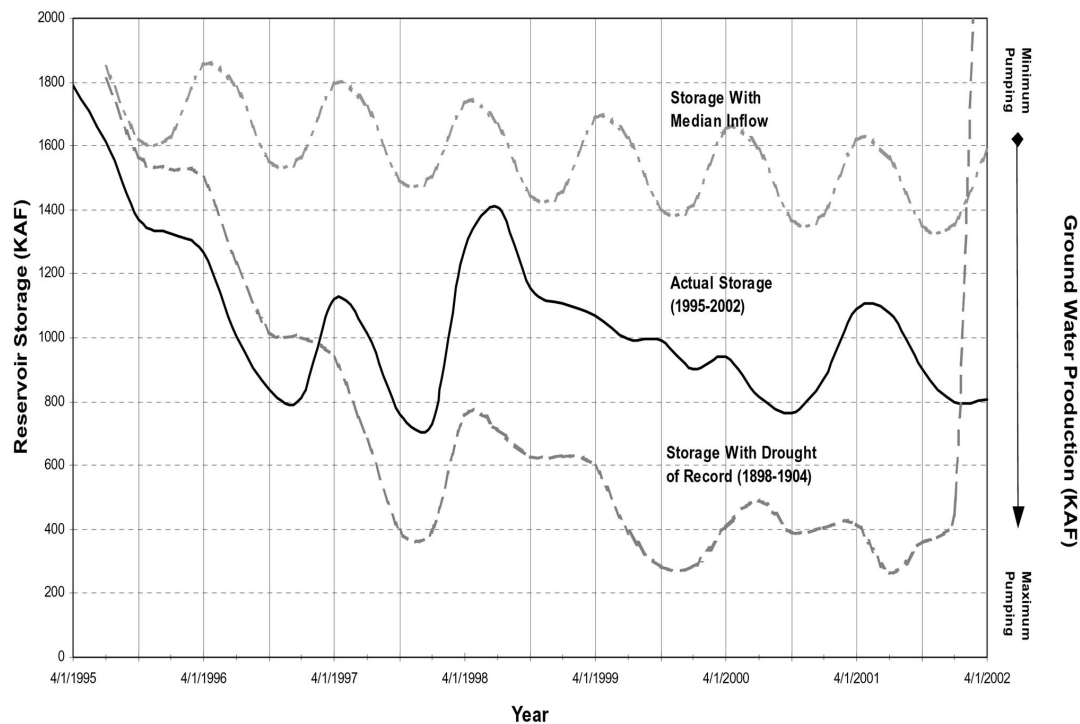
- Managing suitable riparian habitat at and near Roosevelt;
- Creating or restoring, and maintaining, additional riparian and marsh habitat near Roosevelt;
- Acquiring and managing riparian habitat in several river basins in central Arizona to provide a diversity of geographic locations that are as near to Roosevelt as practicable;
- Focusing acquisition of riparian land in locations that birds are expected to occupy, i.e., in proximity to existing populations of flycatchers, Yuma clapper rails, and cuckoos;
- Acquiring mitigation habitat that is similar to Roosevelt in terms of vegetation composition and patch sizes;
- Continuing assistance with monitoring, maintenance, and protection of bald eagle nest sites near Roosevelt; and
- Ensuring that the RHCP is compatible with the recommendations of the FWS recovery team to the extent feasible.

One of the goals of Section 10, beyond providing a regulatory mechanism to permit the incidental take of federally listed species by non-Federal entities, is to reduce conflicts between listed species and economic development activities. Congress has encouraged partnerships among the public, municipal, state, and Federal agencies in the interests of endangered and threatened species and habitat conservation (H.R. Rep. No. 97-835, 97<sup>th</sup> Congress, Second Session). To this end, the RHCP was developed by SRP in consultation with the FWS, Arizona Game and Fish Department (AGFD), U.S. Bureau of Reclamation (Reclamation), local municipalities, and other interested parties.

### **1.3 Need for the Proposed Action**

Over time, the fluctuating lake level at Roosevelt and occasional scouring floods have resulted in varying amounts of riparian vegetation along the two major watercourses that feed the lake, the Salt River and Tonto Creek (Ohmart 1979). Following large scouring floods and sediment deposition between the late 1970s and early 1990s, new riparian vegetation has become established on the Salt River and Tonto Creek inlets to Roosevelt. Since 1995, low water levels caused by recent years of drought (Figure 2) have resulted in an increase in riparian vegetation on the exposed lakebed historically used by SRP to store water for use in the Phoenix metropolitan area. The current drought has exceeded the drought of record, which occurred from 1898 to 1904.

**Figure 2. Comparison of Roosevelt Storage Under Median Inflows, Actual Storage, and Previous Drought of Record (SRP's Storage and Pumping Planning Diagram).**



Notes:

- 1) The graph's Y-axis scale stops at 2,000,000 AF. This represents only SRP's water storage space within the reservoir system, not the storage space held by others and operated by SRP under agreements.
- 2) The drought of record ended after 6 years with enough runoff to fill SRP's current storage space.

The increase in riparian habitat within the normally flooded Roosevelt lakebed has resulted in colonization of the tall dense vegetation by southwestern willow flycatchers, and use of this habitat by other listed and candidate species. In 1993, flycatchers, a species listed as endangered in 1995, were discovered at Roosevelt Lake. The population of this species has increased steadily in the area from 1993 to 2002, except for slight declines from 1994 to 1995 and 1996 to 1997. Small areas of marsh wetlands within the Roosevelt lakebed have also developed to provide potentially suitable habitat for Yuma clapper rails. The riparian vegetation around Roosevelt also provides habitat for bald eagle and cuckoo. An ITP is needed because continued operation of the lake under existing objectives will eventually result in increased water levels following normal or above normal precipitation. Increased water levels would inundate all or portions of the riparian vegetation recently colonized by flycatchers, which would periodically displace flycatcher use at Roosevelt. Fluctuations in lake levels and associated periodic changes in riparian and marsh habitat within the lakebed could also affect use by Yuma clapper rails, bald eagles, and cuckoos.

SRP developed the RHCP to minimize and mitigate impacts to flycatchers, Yuma clapper rails, bald eagles, and cuckoos, and their habitat associated with SRP's continued operation of Roosevelt. Other species for which SRP is not seeking permit coverage also may benefit from the conservation measures provided in the RHCP.

## **1.4 Scoping and Public Involvement**

### **1.4.1 Advisory Group, Scoping, and Meetings**

Public involvement in development of the RHCP was initiated with the establishment of an Advisory Group. In March 2001, invitations to participate in the Advisory Group were sent to representatives of state and Federal agencies, Indian tribes, cities, recreational groups, and environmental groups. Meetings of the Advisory Group were held on April 20, August 21, and November 13, 2001 to solicit input on all aspects of the RHCP and EIS. Additional meetings were held on January 15 and April 2, 2002 to review information to be submitted in the draft RHCP and to solicit comment. The following organizations attended all or some of the Advisory Group meetings:

- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Arizona Municipal Water Users Association
- Bureau of Reclamation
- Center for Biological Diversity
- City of Phoenix
- City of Tempe
- Fish and Wildlife Service
- Forest Service
- Maricopa Audubon Society
- Salt River Pima-Maricopa Indian Community
- Sierra Club

Public involvement in scoping of the RHCP and EIS also was solicited through public notice in the Federal Register (66 FR 45690, August 29, 2001), mailing of approximately 300 scoping announcements in September 2001, and a FWS news release dated October 16, 2001. On September 17, 2001, legal advertisements of the scoping process ran in the Scottsdale and East Valley Tribunes, The Arizona Republic, and the Arizona Business Gazette. A public scoping meeting was held on October 22, 2001 at SRP offices in Tempe, Arizona to solicit comments on the EIS and RHCP. Approximately 25 people attended the public meeting. A total of 18 written comments were received from individuals, environmental organizations, and state and local governments.

### **1.4.2 Issues Raised during Scoping**

The scoping process identified a variety of issues associated with the proposed action. The identification of significant and insignificant issues is an important component of NEPA analysis. Significant issues are analyzed in detail, while minor issues are either

dismissed or briefly discussed. This section describes significant issues identified during scoping that are discussed in the following sections of this EIS.

Based on comments received during the scoping process and additional information received during preparation of the EIS, nine categories of significant issues were identified:

1. Water Supply Alternatives
2. Impacts on the Flycatcher and Recovery Efforts
3. Impacts on the Bald Eagle, Yuma Clapper Rail, and Cuckoo
4. Mitigation of Impacts on Listed Species
5. Impacts on Recreation
6. Impacts on Flood Control
7. Impacts on Water Quality
8. Impacts on Wildlife Habitat
9. Impacts on Socioeconomics

Each of these issues is described briefly below. In accordance with NEPA regulations, the FWS used these significant issues as the focus of the environmental impact analysis in the EIS.

#### ***1.4.2.1 Water Supply Alternatives***

Because Roosevelt Lake supplies water to the Phoenix metropolitan area, there is concern that a change in the current operations at Roosevelt Lake would reduce the available water supply to the greater Phoenix area and require acquisition or development of alternative water supplies. A loss in the reliability of water supplies, particularly during drought, is an issue of concern. Questions were raised on the feasibility of increased use of ground water, additional use of CAP water, improved water conservation measures, retirement of agricultural lands, ground water recharge, or other water sources to augment water supplied by Roosevelt. Alternatives that rely on greater use of the Verde River reservoirs or re-operation of the Salt and Verde River reservoir system were recommended by some commenters. There is concern that any alternative considered should balance the need to provide a secure water supply for the Phoenix area with conserving protected species.

#### ***1.4.2.2 Impacts on the Flycatcher and Recovery Efforts***

A population of the endangered flycatcher now occupies habitat within the boundary of the Roosevelt Lake water storage basin. There is concern about how the periodic filling of the reservoir and inundation of habitat used by the flycatcher would affect recovery efforts. Commenters questioned whether flycatchers would find new breeding grounds, how their migration and movement would be affected, and the likely survival of the Roosevelt flycatcher population.

#### ***1.4.2.3 Impacts on the Bald Eagle, Yuma Clapper Rail, and Cuckoo***

Threatened bald eagles and candidate cuckoos also use habitat at and near Roosevelt. There is concern that filling the reservoir will adversely affect habitat used by these species. Although not discovered until after public scoping and Advisory Group meetings, a Yuma clapper rail was observed in marsh habitat along the Tonto River inlet to Roosevelt in the spring of 2002. Potential impacts to this species also are likely to be of concern to the public.

#### ***1.4.2.4 Mitigation of Impacts on Listed Species***

Implementation of the RHCP is intended to minimize and mitigate impacts to the flycatcher, Yuma clapper rail, bald eagle, and cuckoo and their habitat associated with SRP's continued operation of Roosevelt. Commenters raised concerns regarding the amount, location, and suitability of mitigation habitat. Questions were raised as to the feasibility of protecting or creating habitat at Roosevelt. Several comments from scoping indicated a desire to acquire certain properties or reduce grazing as part of the mitigation plan. The preservation of existing habitat was recommended over creation of new habitat by some commenters.

#### ***1.4.2.5 Impacts on Recreation***

Roosevelt Lake currently supports a variety of recreational uses including fishing, boating, and camping. There is a concern about the potential impact on these activities from possible changes in Roosevelt operation.

#### ***1.4.2.6 Impacts on Flood Control***

Roosevelt currently provides flood control benefits to downstream Phoenix metropolitan area cities. There is a concern that changes to reservoir operations could increase the frequency or magnitude of Salt River flood flows through Phoenix. Of related concern is how possible flooding or reservoir re-operation would affect downstream improvements on the Salt River, such as the Granite Reef Diversion Dam or the Tempe Town Lake.

#### ***1.4.2.7 Impacts on Water Quality***

An issue of concern is how changes in the operation of Roosevelt would affect water quality in the reservoir and the Salt River. The control of grazing in the Salt River watershed was recommended in some comments to improve watershed health and water quality.

#### ***1.4.2.8 Impacts on Wildlife Habitat***

Roosevelt provides habitat for a variety of wildlife other than federally listed species. There is concern that continued reservoir operations or a change in the operation of Roosevelt or other SRP reservoirs may impact habitat for other wildlife species present in the area.

#### ***1.4.2.9 Impacts on Socioeconomics***

Six municipalities (Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe) in the Phoenix metropolitan area and Reclamation have a substantial investment in Modified Roosevelt Dam. There is a concern that potential changes to the operation of Roosevelt could impact the Cities by reducing available water supplies developed by previous financial investments. There is also a concern that it may not be possible for SRP or the Cities to secure alternative water supplies to replace lost active conservation space at Roosevelt. Commenters expressed concerns that development of alternative water supplies would be very expensive and would result in additional direct and indirect impacts to the local and regional economy. The potential loss of hydropower generation and the financial cost of replacing lost energy production also is an issue of concern for SRP and the regional municipalities and entities served by SRP.

#### **1.4.3 Issues Selected for Further Consideration**

Based on information received during the scoping process from the Advisory Group and public comments, FWS and SRP determined that all of the issues described in Section 1.4.2 (water supply, listed species, recreation, flood control, water quality, wildlife, and socioeconomics) should be considered in detail in the EIS. The biological issues regarding the potential impacts to the flycatcher, Yuma clapper rail, bald eagle, and cuckoo would be addressed in the greatest level of detail. Additional impact topics selected for discussion in the EIS include vegetation, wetlands, visual resources, water resources, cultural resources, land use, geology and soils, aquatic resources, and air quality.

### **1.5 Decisions, Permits, and Approvals**

Several decisions and actions by the FWS and SRP are necessary to authorize incidental take and to implement the RHCP. The actions required by each entity are described below.

#### **1.5.1 Decisions and Actions by FWS**

FWS is the agency delegated the authority by the Secretary of the Interior to approve or deny Section 10 permits in accordance with the ESA. In acting on SRP's permit application, FWS must determine whether the RHCP meets the approval criteria specified in the ESA and Federal regulations as previously listed in Section 1.2.

As part of the action on the Section 10 permit, FWS will provide the public an opportunity to comment on the draft RHCP and draft EIS. These documents will be available for public review for 60 days. Under Section 7 of the ESA, issuance of an ITP by FWS is a Federal action subject to Section 7 compliance. This requires FWS to conduct an internal formal Section 7 consultation on permit issuance. Formal consultation terminates with preparation of a biological opinion (BO), which provides FWS' determination as to whether the proposed action, including SRP's implementation of the RHCP, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. Section 7 consultation and preparation of the BO parallel the NEPA process.

Following public input, if FWS determines there would be no jeopardy to listed species or adverse impacts to critical habitat and that ESA criteria under Section 10 have been met, FWS must issue the permit. If FWS determines other measures are necessary or appropriate to carry out the purposes of Section 10, it may require that other measures be implemented as a condition of the permit. If the issuance criteria are not met, FWS will deny the permit.

Following review and response to comments on the Draft EIS, a Final EIS (FEIS) will be prepared by FWS. The FEIS will include a response to public comments and changes in the proposed action, alternatives, impacts, or mitigation measures as appropriate. A Record of Decision (ROD) will be issued by FWS following release of the FEIS and is the decision-making document explaining the rationale for selection of the preferred alternative and any required mitigation.

If FWS decides to issue the permit, it will enter into an Implementing Agreement (IA) with SRP to formalize assurances regarding implementation of the RHCP. The IA must be approved by the Office of the Solicitor in the Department of the Interior. SRP has provided a draft IA and draft permit terms and conditions (Appendices 7 and 8 of the RHCP). Permit approval and implementation of the RHCP as determined by the ROD would require FWS to:

- Ensure that proposed mitigation lands provide replacement habitat for flycatcher, Yuma clapper rail, bald eagle, and, if listed, cuckoo;
- Monitor implementation of the RHCP and compliance with the terms and conditions of the Section 10 permit and IA; and
- Act on proposed amendments to the RHCP, Section 10 permit, or IA.

In 1998, the Department of Interior promulgated rules with respect to assurances under Section 10 permits, commonly known as “No Surprises” (50 CFR § 17.3, 17.22 (b)(5) and (6), 17.32 (b)(5) and (6)). The rules provide certainty for private landowners that if changed or unforeseen circumstances occur during the life of an HCP, “... provided the plan is being properly implemented...[FWS] will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the conservation plan without the consent of the permittee.”

### **1.5.2 Decisions and Actions by SRP**

SRP is seeking a 50-year permit and agreement authorizing the incidental take of flycatcher, Yuma clapper rail, bald eagle, and cuckoo. If the permit were approved, SRP would be required, prior to implementation of the RHCP, to approve and sign the IA with FWS. The IA and RHCP would require SRP to implement the mitigation and monitoring requirements described in the conservation plan. Mitigation and monitoring measures may require entering into agreements with public agencies or private landowners regarding the conservation and management of flycatcher habitat or the purchase and management of mitigation properties. SRP also would be responsible for adaptive



management to address future changes in conditions that may affect mitigation and monitoring measures.

# **Chapter 2**

## **Background**

### **2.1 Description of Applicant and Beneficiaries**

SRP refers to the Salt River Valley Water Users' Association and the Salt River Project Agricultural Improvement and Power District. SRP was authorized in 1903 under the 1902 Reclamation Act.<sup>4</sup> Formed as an Arizona Territorial Corporation on February 9, 1903, the Salt River Valley Water Users' Association (Association) consists of shareholders owning lands within the Project boundaries.

The Salt River Project Agricultural Improvement and Power District (District) was formed by SRP in 1937. Under contract with the Association, the District assumed the obligations of the Association for the overall operation, care and maintenance of the Project. The Association continues to operate the irrigation system as an agent of the District. The District owns and operates the electric and power system. The power system operated by SRP includes eight hydroelectric units on the Salt River dams with an installed generating capacity of about 260 megawatts. SRP supplies power to more than 700,000 customers from a combination of hydroelectric, thermal and nuclear resources (SRP 2001, p. i). The area served power by SRP is shown in Figure 3.

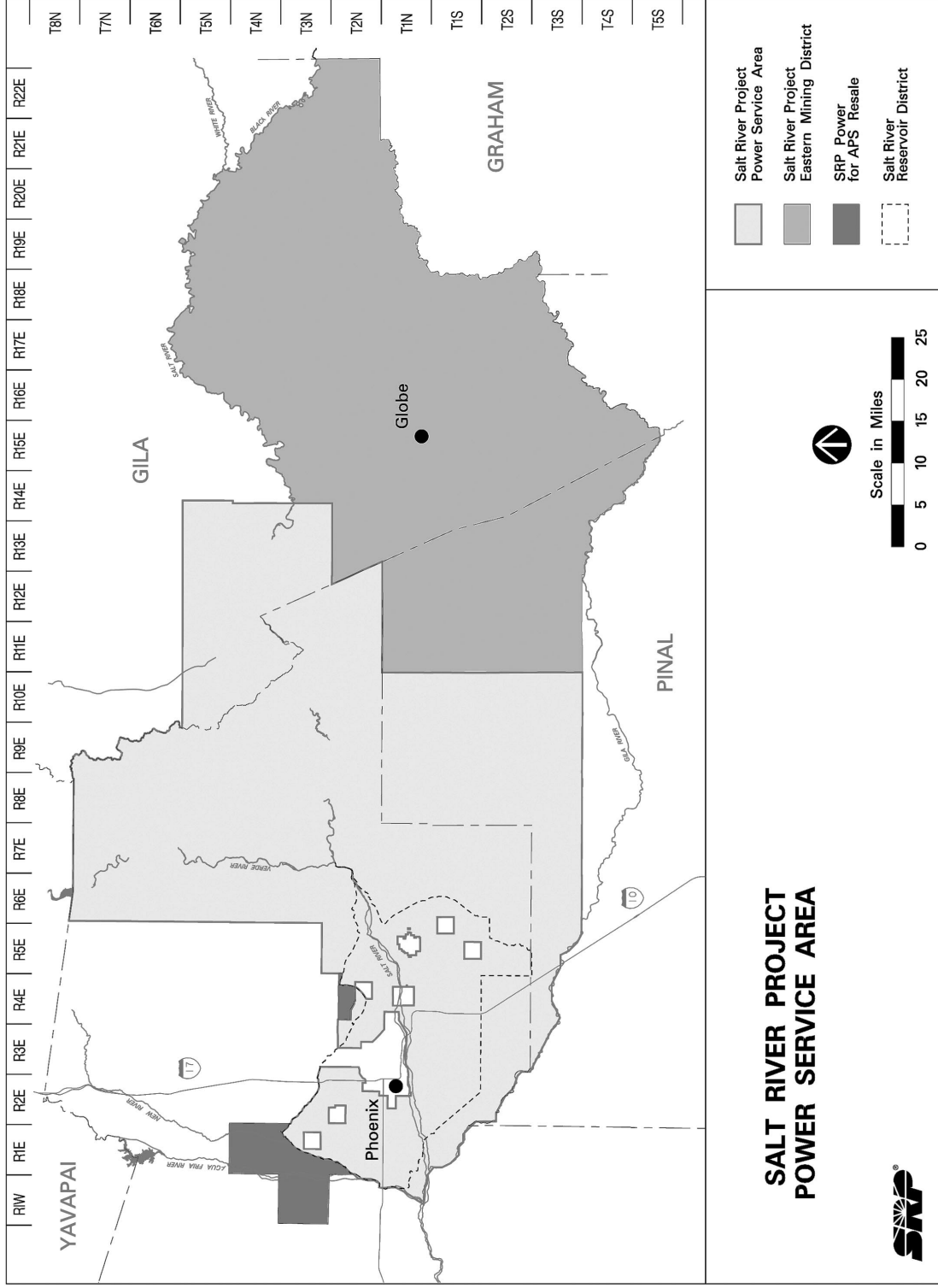
SRP shareholder lands have vested rights to water stored in SRP's reservoirs. SRP shareholder lands subscribed to the Association entitles those lands to delivery of a share of the water stored behind SRP's reservoirs, including Roosevelt Dam. In addition to the rights to SRP stored water, many shareholder lands also have individual rights to the normal flow of the Salt and Verde rivers, which predate the construction of SRP's reservoirs.

Water from Roosevelt and SRP's other reservoirs is provided directly by SRP to shareholder lands for irrigation and other uses, and is delivered to the cities of Phoenix, Mesa, Chandler, Tempe, Glendale, Gilbert, Scottsdale, Tolleson, Avondale, and Peoria for delivery to shareholder lands. In addition to providing water to shareholder lands, SRP is obligated by contract to deliver water to cities, irrigation districts, Indian communities, and individual water users having water rights to the Salt and Verde rivers. The cities of Avondale, Chandler, Gilbert, Glendale, Mesa, Peoria, Phoenix, Scottsdale, Tempe, and Tolleson have rights to water stored, developed and delivered by SRP.

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<sup>4</sup> March 7, 1903 letter from C.D. Walcott, Director, U.S. Geological Survey to Secretary of the Interior E.A. Hitchcock. Secretarial Approval on March 14, 1903. *In*: U.S. Bureau of Reclamation project feasibilities and authorizations. U.S. Printing Office, Washington, D.C. 1957.

**Figure 3. Regional Map Showing Power Service Area.**



In addition, the cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe (the Cities) have rights to storage and delivery of water from Modified Roosevelt (Roosevelt Dam modifications completed in 1996). Water also is delivered from the SRP reservoir system to the Salt River Pima-Maricopa Indian Community, Fort McDowell Indian Community, Gila River Indian Community, Buckeye Irrigation Company, Roosevelt Water Conservation District, and others in satisfaction of their independent water rights. The location of SRP shareholder lands and individual water users within the Salt River Reservoir District, as well as irrigation districts, and Indian communities receiving water from SRP are shown in Figure 4. In addition, exchange agreements with SRP and the cities of Avondale, Chandler, Gilbert, Glendale, Mesa, Peoria, Phoenix, Scottsdale, Tempe, and Tolleson; Tonto National Forest, Reclamation, and other entities are facilitated by water stored in Roosevelt.

## **2.2 Description of SRP Reservoir System and Storage Operations**

SRP water deliveries are primarily to cities and urban irrigation uses and form a large portion of the total water supply to the Phoenix metropolitan population of more than 2.6 million (SRP 2001, p. 8). Annual surface water diversions within the SRP system average about 900,000 AF, which provides approximately 40 percent of the water supply to the Phoenix Active Management Area (AMA), an area of approximately 5,600 square miles (ADWR 1994, p. 78). Within the Phoenix AMA, SRP delivers surface and ground water to 375 square miles of shareholder land (SRP 2001, p. i).

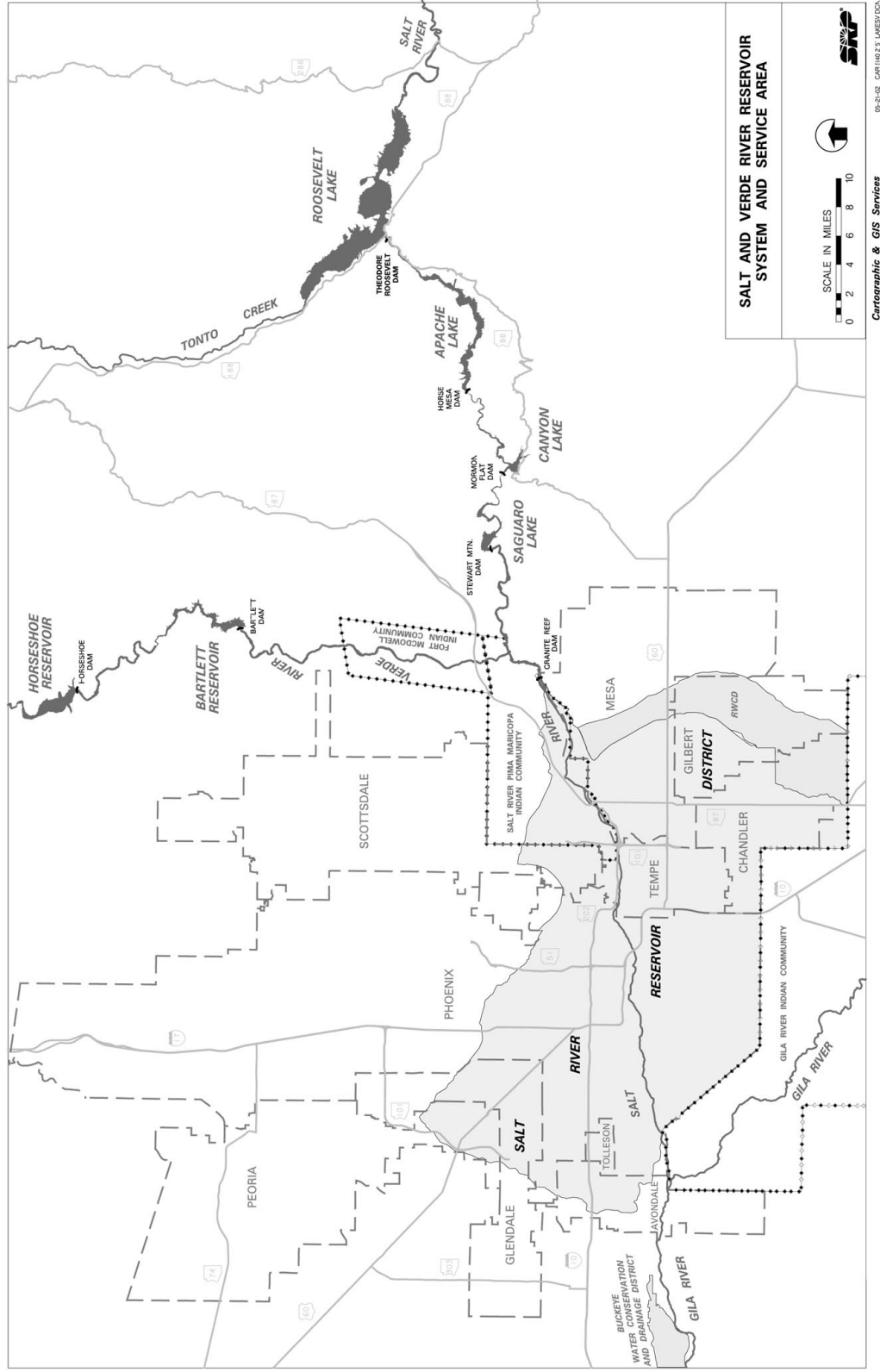
### **2.2.1 Overview**

The use of the entire capacity of Roosevelt Lake is fundamental to the ability of SRP and cities to meet the water demand in the Phoenix metropolitan area. The other reservoirs in the system do not have the capacity to store enough water for extended droughts. The process of filling Roosevelt to capacity and slowly drawing it down year after year to nearly empty has occurred eight times in SRP's history. Without Roosevelt's large capacity to buffer drought conditions, the Phoenix metropolitan water supply would be in jeopardy. Roosevelt's operation is intertwined with the operations of all six surface water storage reservoirs as well as ground water pumping. When the SRP surface water supply from the reservoirs drops because of prolonged drought conditions, ground water pumping is utilized to supplement the available water supply. However, the use of ground water is being increasingly restricted by the Arizona Groundwater Management Act (A.R.S. § 45-401 et seq.).

### **2.2.2 History**

Modern irrigation in the Salt River Valley began in the 1860s. Many diversion dams, canals, and laterals were constructed between 1867 and 1902. As the requirements for irrigation water increased and the cycles of extreme flood and drought became problematic, engineers and surveyors began to explore the possibility of large-scale

Figure 4. SRP Reservoir System and Water Service Area.



storage structures to control the region's water supply.<sup>5</sup> The Salt River, from Phoenix to its headwaters in the White Mountains, and the Verde River, the Salt River's major tributary, were surveyed to determine the best location for a major storage structure. One of these investigations concluded that the confluence of the Salt River and Tonto Creek appeared to be an ideal site for a storage reservoir with a capacity exceeding 1 million acre feet of water (Smith 1986, pp. 1-14). The efforts to store water at Roosevelt were initiated in 1893 when the original plan was developed to construct a reservoir at that location (Id. pp. 8, 9).

The construction of Roosevelt Dam began in 1903 and was completed in 1911 by Reclamation. Water was first stored behind the dam in 1910. In 1917, the United States turned over to and vested in the Association the authority to care for, operate and maintain the Project, of which Roosevelt Dam is an integral component.<sup>6</sup> SRP continues to operate the Project pursuant to that contract.

Since its completion in 1911, Roosevelt Dam has continuously provided water for irrigation, municipal and industrial uses, and hydroelectric power generation. SRP stores, diverts, uses, and delivers water from the Salt and Verde rivers and their tributaries pursuant to various water rights. A summary of SRP and municipal water rights is included in Appendix 2 of the RHCP. Roosevelt also provides a variety of recreational uses such as fishing, boating, and camping. Environmental benefits include the creation and maintenance of riparian habitat around the lake, fishery and waterfowl habitat, foraging habitat for bald eagles, and generation of energy without emissions or nuclear waste.

The original conservation storage space behind Roosevelt is on land withdrawn from the public domain in 1903 by Reclamation for purposes of the Salt River Project.<sup>7</sup> Additional land was withdrawn on December 3, 1999 in the area that could be inundated as a result of the modifications to Roosevelt Dam (64 FR 67929). The withdrawn land surrounding the reservoir is managed under a three-way agreement among SRP, Reclamation, and the Forest Service. Reclamation has primary jurisdiction over withdrawn lands in cooperation with SRP when the lands are used for Reclamation purposes, which may include facilities such as the dam, spillway, employee housing, transmission lines and equipment, and material storage. The Tonto National Forest is responsible for management of recreation and other public land uses.<sup>8</sup>

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<sup>5</sup> The key impetus to construct Roosevelt came from the need for a stable water supply in the face of major floods in the late 1880s and early 1890s followed by a severe drought in the late 1890s (Smith 1986, pp. 1-14).

<sup>6</sup> See contract dated September 6, 1917 between the Salt River Valley Water Users' Association and the United States; 43 U.S.C. § 499.

<sup>7</sup> See letter from E.A. Hitchcock, Secretary of Interior to The Commissioner of the General Land Office, March 9, 1903.

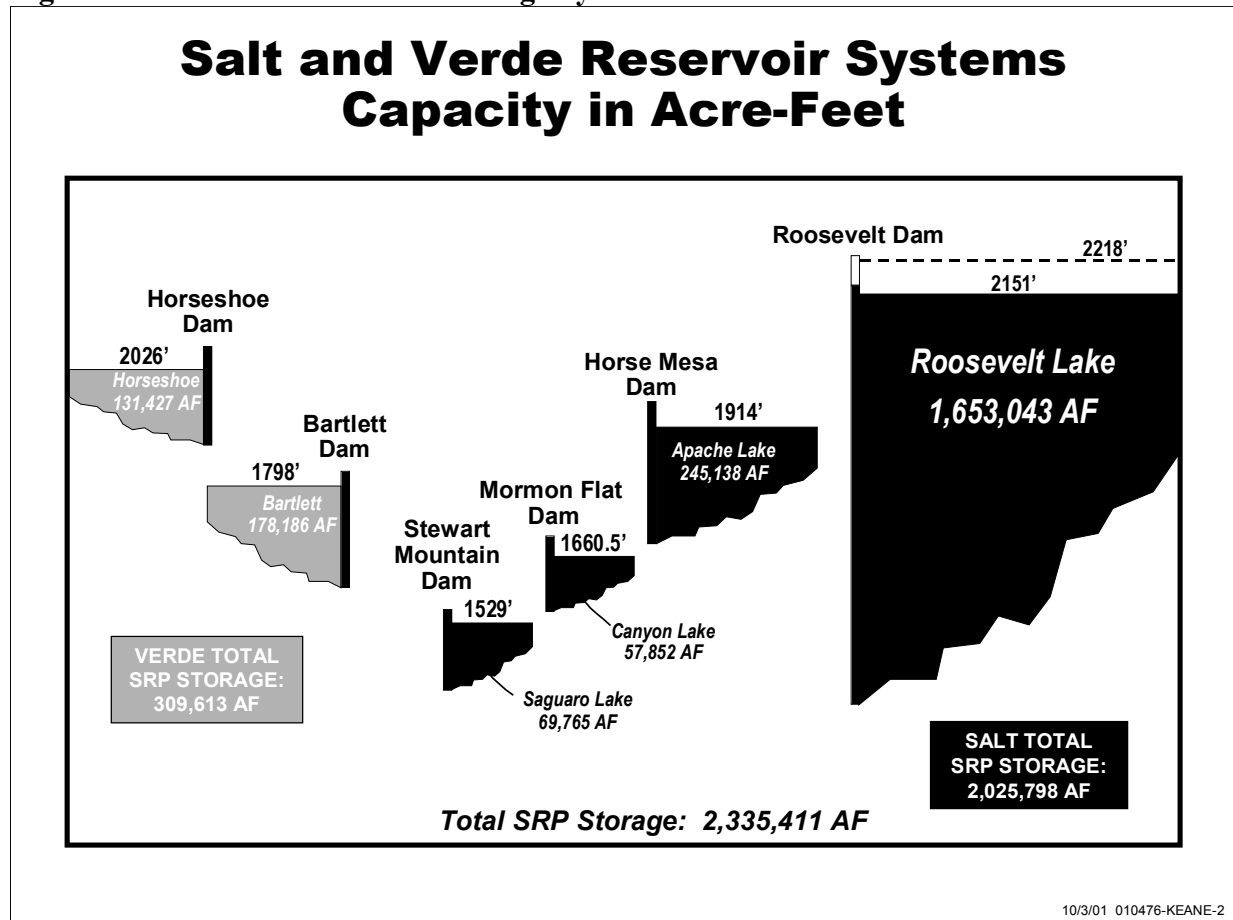
<sup>8</sup> See Management Memorandum Among the Salt River Project Agricultural Improvement and Power District, United States Department of Agriculture Forest Service, and United States Bureau of Reclamation, April 27, 1979.

### 2.2.3 Salt River Reservoir System

SRP's operation of Roosevelt is best understood in the larger context of SRP's conjunctive operation of all six SRP reservoirs on the Salt and Verde rivers. The SRP reservoir system is operated as a cohesive unit providing much of the water used in the Phoenix metropolitan area. Located at the confluence of Tonto Creek and the Salt River about 60 miles northeast of Phoenix in Gila and Maricopa Counties (Figure 4), Roosevelt Dam and Lake filled to capacity for the first time in 1916. Three additional dams, Horse Mesa, Mormon Flat and Stewart Mountain, were constructed on the Salt River downstream of Roosevelt in the 1920s and 1930s to complete the reservoir system on the Salt River. On the Verde River, Bartlett Dam was constructed in the 1930s and Horseshoe Dam, upstream from Bartlett, was completed in 1945. A profile view of the SRP reservoir system is presented in Figure 5.

Roosevelt remains the cornerstone of SRP's storage system. The conservation storage capacity in Roosevelt (1,653,043 AF) represents 71 percent of the total surface water storage in the SRP system. Roosevelt and the other five reservoirs on the Salt and Verde rivers are operated as integral features of SRP's water system. SRP also operates

Figure 5. Profile of SRP Water Storage System.



Note: the maximum conservation storage elevation above mean sea level is shown for each dam, and the maximum flood control elevation (2,218 feet) is also shown for Roosevelt.

Granite Reef Diversion Dam located just below the confluence of the Salt and Verde rivers, about 250 wells, and an interconnection to the Central Arizona Project to deliver water through nearly 1,300 miles of canals, lateral ditches and pipelines.<sup>9</sup>

As originally constructed, Roosevelt Dam was 280 feet high and had a water storage capacity of 1,284,205 AF. Subsequently, capacity slightly increased and decreased over time as the spillway was modified and silt accumulated. From 1989 through early 1996, Roosevelt Dam was subjected to extensive modifications by Reclamation to provide additional conservation storage capacity and to address safety concerns identified under the Reclamation Safety of Dams Act of 1978 (43 USC § 506 et seq.). The modified dam (Modified Roosevelt) provides for additional water conservation storage space, dam safety, and for the first time, dedicated flood control space.<sup>10</sup> The top of SRP's original conservation storage space is at an elevation 2,136 feet.<sup>11</sup> This elevation represents the existing storage capacity held by SRP in 1995 when modifications to the dam were completed to add additional conservation storage and flood control space to Roosevelt. The rights to use water stored in the additional conservation capacity in Modified Roosevelt (New Conservation Space, NCS) are vested in the six Salt River Valley cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe (see Appendix 2 of the RHCP). The Salt River Pima-Maricopa Indian Community is also entitled to use a portion of the NCS pursuant to the Salt River Pima-Maricopa Indian Community Water Rights Settlement Act (102 Stat. 2549). The top of the NCS capacity is at elevation 2,151 feet (Figure 5). The uppermost increment of storage behind Modified Roosevelt, from elevation 2,151 feet up to elevation 2,218 feet, is reserved for flood control and dam safety purposes (Figure 5; Reclamation 1999, p. 2).

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<sup>9</sup> See [www.srpnet.com/water](http://www.srpnet.com/water).

<sup>10</sup> While the original storage capacity of the dam did much to reduce the damage to valley farms from the pre-dam flooding that ravaged the farms of the settlers of the 1890s, continued growth of water demand in central Arizona, the extreme flood events of the late 1970s and early 1980s, and concerns about dam safety convinced planners that additional reservoir space was needed.

<sup>11</sup> The top elevation of SRP's storage space in Modified Roosevelt varies over time as sediment accumulates behind Roosevelt, beginning at slightly less than 2,137 feet in 1995 and declining to an estimated 2,136 feet in 2040.



## 2.2.4 Roosevelt Operations

SRP continues to be responsible for operation of all of the conservation storage space at Roosevelt under the 1917 contract referenced above, the Plan 6 Funding Agreement, and the Modified Roosevelt Operating Agreement (Operating Agreement).<sup>12</sup> The Operating Agreement provides guidelines for reservoir operations and states that SRP shall manage the SRP reservoir system to minimize releases of water over, around, or downstream of Granite Reef Diversion Dam in accordance with the following SRP conservation storage objectives (in order of priority) and in accordance with the flood control operating criteria established by the U.S. Army Corps of Engineers (Water Control Manual, Reclamation 1996a). The objectives for storage are to:

1. Maintain the safety and integrity of the dams.
2. Maintain sufficient SRP storage to meet SRP water delivery obligations.
3. Optimize reservoir storage for SRP use within the SRP reservoir system.
4. Maintain adequate SRP carryover storage for following years in case of low runoff.
5. Conjunctively manage ground water pumping given reservoir storage and projected runoff and demand.
6. Maximize power generation.
7. Operate to permit necessary facility maintenance

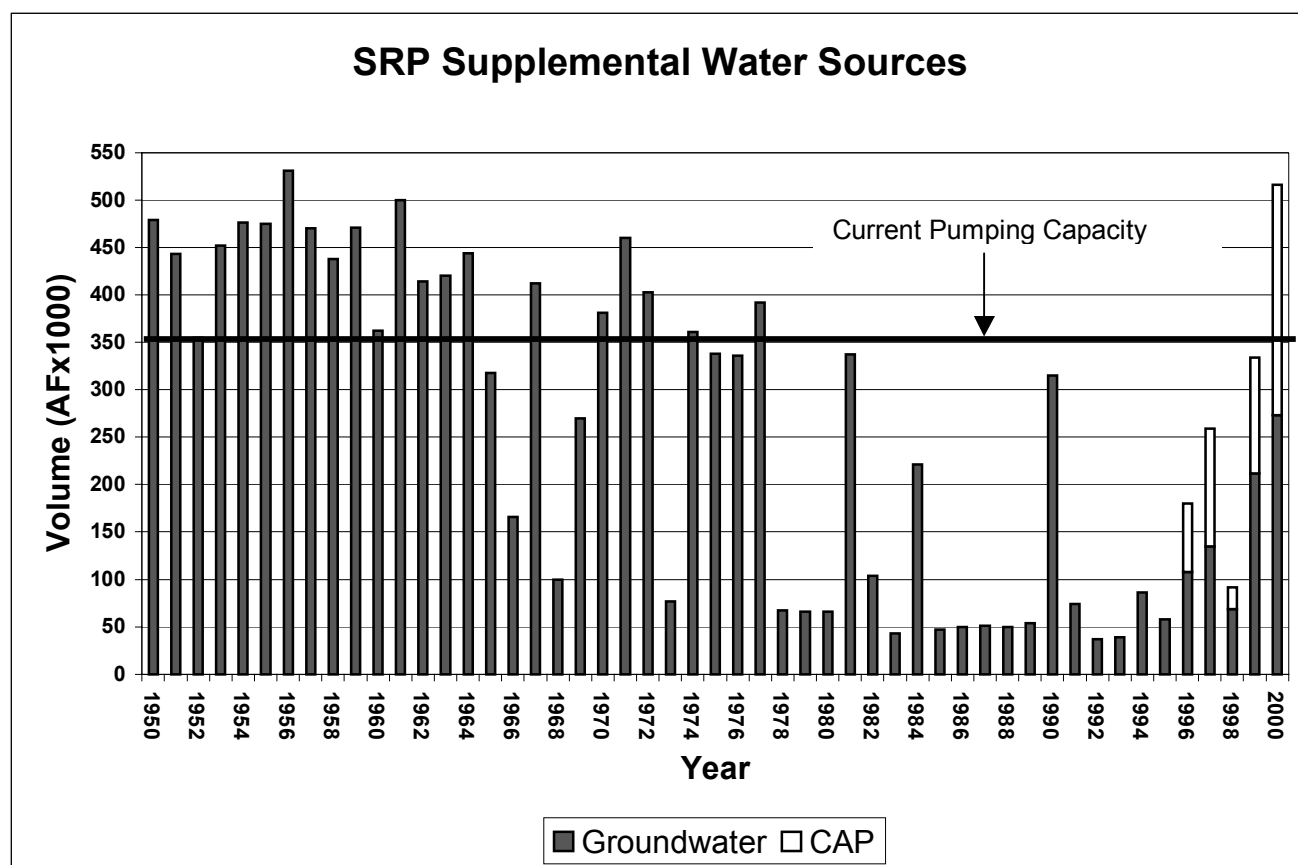
The role of Roosevelt as drought protection is the basis of much of SRP's water supply planning. In order to supply the water delivery obligations described above, the policy behind SRP's planning is to extend reservoir storage through at least 7 years of below normal runoff conditions, the length of long-term sustained drought conditions experienced historically. Each year, SRP sets an annual water allocation available to SRP shareholder lands based on existing and projected reservoir storage conditions. The allocation is provided by a mix of water from two general sources: 1) surface water from the reservoir system; and 2) ground water from deep wells within the boundaries of the Salt River Reservoir District (Figure 4).

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<sup>12</sup> Agreement Among the United States, the Central Arizona Water Conservation District, the Flood Control District of Maricopa County, the Salt River Project Agricultural Improvement and Power District and Salt River Valley Water Users' Association, and the Arizona Cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale and Tempe, the State of Arizona, and the City of Tucson for Funding of Plan Six Facilities of the Central Arizona Project, Arizona and for Other Purposes, April 15, 1986; and Operating Agreement for Additional Active Conservation Capacity at Modified Theodore Roosevelt Dam Among the Salt River Project Agricultural Improvement and Power District, Salt River Valley Water Users' Association, United States Bureau of Reclamation, Flood Control District of Maricopa County, and the Arizona Cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale and Tempe, December 14, 1993.

Surface water is used to meet the SRP allocation and contract deliveries whenever possible because it is a renewable supply and is the least-cost source of water. SRP diverts about 900,000 AF of surface water per year on average, of which about 60 percent is supplied by storage in Roosevelt (Ester, pers. comm. 2001). Ground water is used to supplement the available surface water supplies throughout each cycle of drought. SRP's ground water resources alone are insufficient to meet its water delivery obligations. Also, Arizona law discourages reliance on ground water by mandating strict conservation requirements and other limits on ground water use because ground water has been depleted historically, causing land subsidence and concerns about future water supply. For these reasons, additional ground water pumping is not a feasible source to develop for replacement of surface water supplies. As shown in Figure 6, SRP's current ground water pumping capacity is about 350,000 AF/year. In a further effort to reduce reliance on ground water, SRP has supplemented its declining surface water supplies in recent years with surplus CAP water rather than relying entirely on additional pumping. However, this is a short-term option because SRP does not have a contract for CAP water. This option will no longer be available to SRP once CAP water users fully utilize their allocations, or when Colorado River shortages result from low runoff years or increased use by Colorado River Upper Basin states.

**Figure 6. Annual Ground Water Pumping and CAP Water Use.**



The annual mix of SRP water sources is determined, in part, through use of the Storage and Pumping Planning Diagram shown in Figure 2. Under the most basic interpretation of the Planning Diagram, reservoir storage drops (left vertical scale) as water is released for use and subsequent runoff is insufficient to replace those releases. As a result, an inversely related pumping regime is implemented (right vertical scale). Depending on how low total storage drops, the annual allocation to SRP shareholders will be reduced below the normal amount of 3 AF/acre provided when storage is about average. SRP's goal in planning Project water deliveries is for total reservoir storage not to drop below the "drought of record" line. This line reflects the modeled storage levels that would have occurred had the existing reservoirs been full just prior to the start of the 1898-1904 drought of record. The trace of recent reservoir storage is shown by the "actual storage" line. The "median inflow" line represents the storage levels if average runoff had occurred between 1995 and 2001.

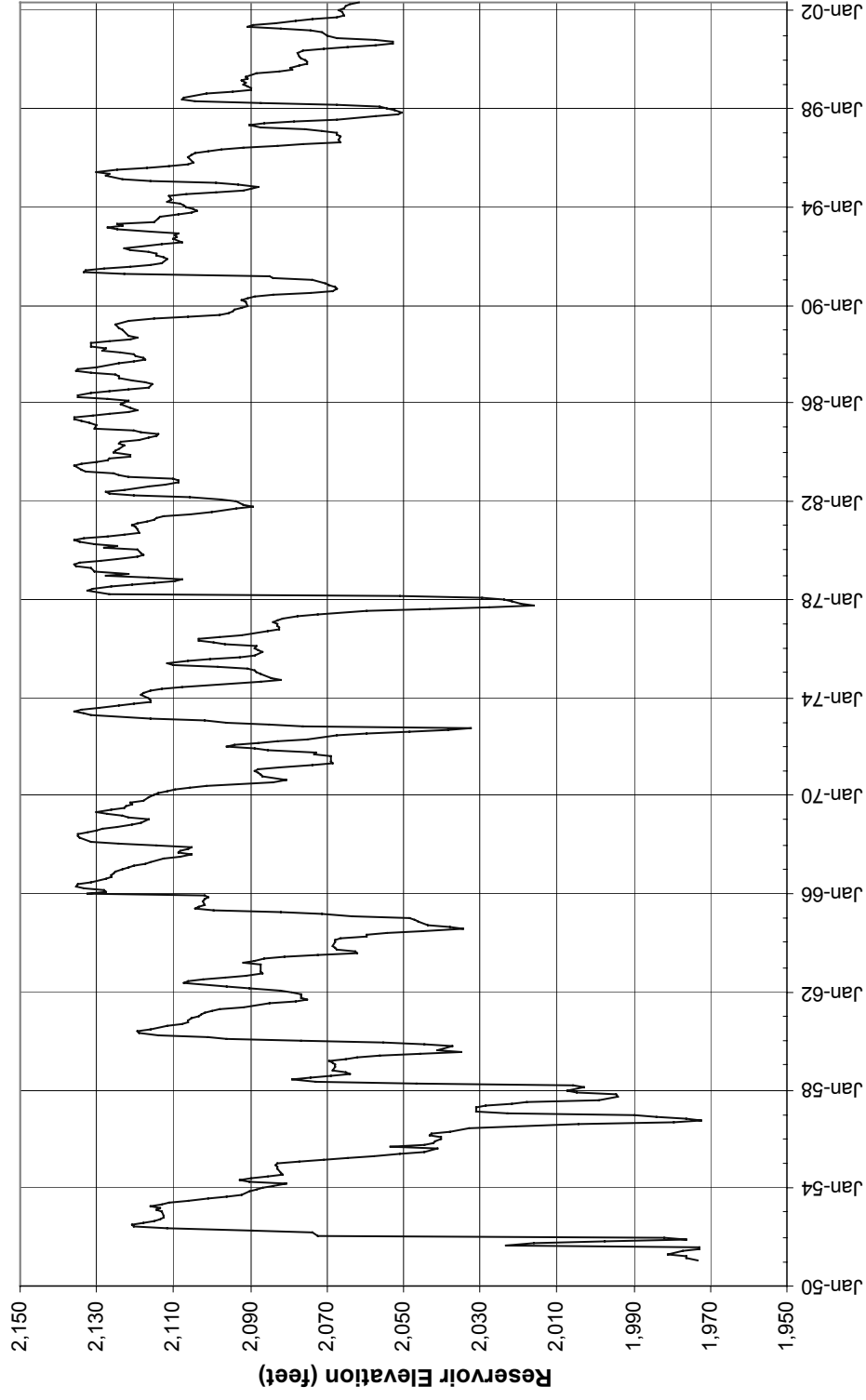
In 1995, the reservoir system nearly filled to historical capacity (elevation 2,136 feet) in the last wet year of recent times. Since then, reservoir storage has been declining except for a minor recovery in the spring of 1997 and a slightly greater recovery in the El Niño spring of 1998. During the last 6 years, SRP's water storage in Roosevelt has declined from 92 percent full in late spring of 1995 to 17 percent full in the late fall of 2000. At the same time, ground water pumping and short-term CAP purchases accounted for an increasingly large share of total SRP water supplies. Some recovery of storage occurred during the spring of 2001 but the winter was not abundantly wet and the watershed, after so many years of drought, quickly soaked up most of the precipitation that fell, which limited runoff. The drought has continued through the winter of 2002 and Roosevelt was only 21 percent full on April 25, 2002.<sup>13</sup> The reservoir level is projected to be as low as 7 to 10 percent of capacity or less by October 2002.

Historically, Roosevelt Lake levels have large annual and long-term variations (Figure 7). Reservoir fill during the winter and early spring is highly variable, with the water level rising by a few feet in some years to more than 100 feet in other years. However, annual releases are more uniform and typically lower the reservoir by about 15 to 25 feet from late spring through summer. Figure 7 also shows a longer-term pattern of 3 to 7 years of low runoff and decreasing reservoir levels followed by a runoff season that fills or nearly fills the lake. Another long-term pattern is decades of below- or above-average runoff, e.g., the relatively dry period of the 1950s and the relatively wet period of the 1980s.

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<sup>13</sup> See <http://www.srpnet.com/water/daily/report.asp?rptdate=4/25/02>.

**Figure 7. Historical Roosevelt Elevations, 1951 through April 2001. Note: Historical elevations dating back to 1911 are shown in Figure 4 of Appendix 3 of the RHCP.**



### 2.2.5 Verde Reservoirs

SRP operates two reservoirs on the Verde River formed by Bartlett and Horseshoe dams. Although used in conjunction with each other, the Salt River reservoirs and Verde River reservoirs differ in their operations. Physically, the Verde River dams have relatively small storage capacity (Figure 5). Only 12 percent of SRP's total storage capacity exists in the Verde River reservoirs. Also, the Verde River reservoirs' capacity of 309,000 acre-feet (including the space behind the Phoenix spillway gates<sup>14</sup> on Horseshoe Dam) is only about two-thirds of the annual average flow of the Verde River. On the Salt River side, the four dams collectively can store more than 3 times the average annual flow of the river. This imbalance in storage capacity requires annual modifications to water storage and releases.

SRP constantly strives, and is contractually committed under the Operating Agreement to operate the entire reservoir system to minimize the risk of spilling water over Granite Reef Dam because any water spilled downstream of Granite Reef Dam is unavailable for meeting annual water demands. Water is delivered from October 1 through April 30 from the Verde River dams in order to keep Verde storage levels low and minimize the risk of spilling water from Bartlett Dam. These months have the lowest demand and the highest potential to produce the greatest amounts of runoff. With the greater storage capacity in the Salt River reservoirs, there is usually sufficient space available to store runoff on that side of the system during the winter and spring and to provide releases during the summer when water demand is the greatest. As a practical matter, Verde storage could not meet summer demand because releases sufficiently large to meet demand would quickly drain the Verde River reservoirs completely.

Hydropower generation is another reason for minimizing releases of Salt River storage during the winter months.<sup>15</sup> SRP has the ability to generate hydroelectricity at each of the Salt River dams but there are no generators on the Verde River dams. During the winter months, SRP generally has ample alternative supplies of power to meet customer needs. In the summer, however, demand for power skyrockets in the hot desert environment of SRP's service area. The hydrogenerators on the Salt River reservoirs provide only about 4 to 5 percent of SRP's annual power production, but represent a low cost, environmentally clean, and renewable energy supply that is readily available to meet peak demands. Without this source of power to meet peak demands, SRP would have to generate or purchase expensive fossil fuel-produced energy.

As a result of the considerations described above, water releases to meet orders are progressively shifted from the Verde River reservoirs to the Salt River reservoirs in late April or early May. However, an agreement between SRP and the Fort McDowell Indian

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<sup>14</sup> Gates in the spillway constructed by the City of Phoenix to increase the storage capacity of Horseshoe Dam (see Appendix 1 of the RHCP).

<sup>15</sup> SRP releases 8 cfs from Stewart Mountain Dam to help sustain native fish populations on the lower Salt River.

Community stipulates that a 100 cfs flow will be maintained from Bartlett Dam except in extreme drought or emergency to help maintain fish habitat and riparian vegetation.<sup>16</sup>

### **2.2.6 Roosevelt Recreation**

Roosevelt Reservoir is a popular recreation destination with opportunities for fishing, boating, picnicking, and camping. During the construction of Modified Roosevelt between 1991 and 1995 over \$30 million was invested in recreation facilities. The new recreation facilities at Roosevelt have a total daily capacity for 18,825 people or about 867,796 recreation days annually for the various activities at the lake (Reclamation 1990). Additional discussion of recreation resources at Roosevelt is included in Chapter 4.

## **2.3 History of NEPA Compliance at Roosevelt Lake**

Over the last 20 years there have been a number of activities and actions at Roosevelt Lake requiring NEPA compliance. Modifications to Roosevelt Dam were authorized by Section 301(a)(3) of the Colorado River Basin Act of 1968 (Public Law 90-537) (CRBA) and the Safety of Dams (SOD) Act of 1978 (Public Law 95-578). The CRBA authorized construction of the Central Arizona Project (CAP) Regulatory Storage Division. The Regulatory Storage Division addressed regulatory storage of CAP water, new water conservation, and flood control of the Salt and Gila rivers through metropolitan Phoenix. The SOD Act authorized modifications to preserve the structural safety of dams and related facilities built by Reclamation, including Roosevelt. Because construction and operation of the CAP Regulatory Storage Division and portions of the SOD program involved activities at the same facilities in overlapping time frames, the purposes of both authorizations were combined in the Central Arizona Water Control Study (CAWCS) (Reclamation 1990).

The CAWCS culminated in the selection of a plan that received strong local support. This plan, called Plan 6, was identified as Reclamation's proposed action in a final environmental impact statement (FEIS) prepared for the CAP Regulatory Storage Division (Reclamation 1984). The Roosevelt Dam component of the FEIS provided for flood control, additional water conservation capacity, and correction of safety of dam deficiencies by modifying Roosevelt Dam.

Impacts from construction of modifications to Roosevelt Dam were further described in three subsequent EAs covering road relocations and upgrades, and refinements to the Roosevelt Dam component of Plan 6 (Reclamation 1986, 1988, 1990). These EAs were prepared when evaluation of proposed refinements and design details indicated resultant effects could have the potential to be substantially different from what was originally described in the FEIS. The modifications evaluated in the 1990 EA included increasing the dam's height to provide additional sediment, flood, and surcharge storage. For each

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<sup>16</sup> The 100 cfs minimum flow is in addition to reservoir releases to meet water orders along the Verde River and is part of the diversion at Granite Reef Dam (Appendix 1 of the RHCP).

EA, Reclamation concluded that a Finding of No Significant Impact (FONSI) was appropriate.

In 1996, a Water Control Manual for Modified Roosevelt Dam was prepared and documented in an EA (Reclamation 1996a). The purpose of the Water Control Manual was to provide a plan for SRP to follow when regulating the dam for flood control purposes during flood events pursuant to the Flood Control Act of 1944 (Section 4.5.8, 58 Stat. 887). The plan was designed to minimize flood damage while providing SRP system operations with flexibility to maximize incidental power generation. A FONSI was issued for the Water Control Manual.

Also, in 1996, Reclamation prepared an EA to assess the potential impacts of Roosevelt modifications to the southwestern willow flycatcher at Roosevelt Lake (Reclamation 1996b). The flycatcher EA tiered from the Regulatory Storage Division FEIS (Reclamation 1984) and the final EA on Roosevelt Dam Modifications (Reclamation 1990), in order to disclose new information relevant to environmental concerns about the flycatcher at Roosevelt Lake. This EA evaluated the environmental consequences to the flycatcher from construction and operation of Modified Roosevelt. In addition, the effects of carrying out the components of reasonable and prudent alternatives (RPA) and reasonable and prudent measures (RPM) included in a 1996 BO were evaluated in the EA (see the discussion on Endangered Species Act compliance for that EA described in Section 2.4.4). A FONSI was issued for that EA.

In 1999, an EA was prepared by Reclamation to address the proposed land withdrawal of an additional 9,820 acres of Forest Service land around Roosevelt Lake. The withdrawal provided Reclamation with jurisdiction over these lands to ensure their use is consistent with water storage and flood surcharge purposes. The land withdrawal involves joint jurisdiction, where Reclamation has jurisdiction over Reclamation's water-related activities, and the Forest Service has jurisdiction over all other land uses, particularly recreation. A FONSI was issued for this action.

## **2.4 History of ESA Compliance at Roosevelt Lake**

Prior ESA compliance at Roosevelt Lake involved the construction and funding of modifications to Roosevelt in the 1990s by Reclamation as previously described and Forest Service consultation on grazing and recreation uses. Reclamation's construction and funding of these modifications were Federal actions under Section 7 of the ESA, which required compliance with the Section 7(a)(2) interagency consultation requirements. The following is a list of Reclamation consultations related to Roosevelt. A summary of Forest Service consultations at and near Roosevelt also is provided.

### **2.4.1 1983/1984**

Under the authority of the CRBA and the SOD acts, Reclamation evaluated a number of options for construction of new water storage facilities and safety modifications to dams in central Arizona. As part of that process, a FEIS was completed on the CAWCS facilities (Reclamation 1984). The Record of Decision selecting the preferred alternative, known as Plan 6, was issued on April 3, 1984. Although other components of Plan 6 were later modified, the plan for construction of modifications to Roosevelt remained

basically unchanged from 1984. The FWS issued its BO for Plan 6, including Roosevelt modifications, on March 3, 1983 (FWS 1990, p. 1). Possible impacts of Roosevelt modifications on the Pinal bald eagle breeding area were part of the basis for an opinion that the project would likely jeopardize the continued existence of the bald eagle population in the Southwest (Id.). The RPA for the Pinal bald eagles identified by FWS to avoid jeopardy was to modify the extent and timing of borrow excavation at Meddler Point near the nest and to restrict recreation access to the area (Reclamation 1992, 3 p.). This alternative was implemented by Reclamation (Id.).

### **2.4.2 1989/1990**

Following issuance of the BO in 1983, two new bald eagle breeding areas were discovered near Roosevelt, the Sheep breeding area and the Pinto breeding area. On July 20, 1989, Reclamation requested re-initiation of consultation on Roosevelt modifications as a result of new information on bald eagle activities at the reservoir (Id.).

Reclamation's 1989 BA concluded that there was not likely to be an impact on the Sheep breeding area located 15 miles upstream from the lake on Tonto Creek, but "the increased conservation pool may affect the Pinto Creek territory by killing the trees in the nesting area, and that the 100-year flood event may affect this territory by inundating the nest tree during the breeding season. In addition, proposed recreation developments may affect the bald eagles" (Id.).

Following the reinitiation of consultation requested by Reclamation on July 20, 1989, FWS issued a BO analyzing the effects of modifications to Roosevelt on the Sheep and Pinto breeding areas. The 1990 BO also addressed bald eagle use of a large cottonwood gallery at the mouth of Tonto Creek (FWS 1990, pp. 2, 4). FWS concluded that the Roosevelt modifications were not likely to jeopardize the continued existence of bald eagles in the Southwest (FWS 1990, p. 1). The BO describes the eventual loss of all or a portion of the cottonwoods, including nesting trees, below elevation 2,151 feet but describes the offsetting benefits of additional shallow water habitat and fringe wetland areas created by higher reservoir levels, and the improvement of riparian habitat in the Tonto Creek Riparian Unit established by Reclamation as mitigation for Modified Roosevelt Dam (FWS 1990, pp. 4, 5). FWS proposed, and Reclamation agreed to implement, two measures to minimize incidental take to the Pinto nest: 1) construction of a bald eagle nesting platform in the Pinto nest area at least 4 years before the nest tree is anticipated to collapse, and 2) closure of recreation use near the Pinto nest area during the breeding season if it becomes active (Reclamation 1992, p. 3).<sup>17</sup> In addition, three

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<sup>17</sup> In the 1990 BO, FWS was skeptical that the Pinto breeding area (occupied by a single female at the time) would ever become viable due to its close proximity to the Pinal breeding area. However, the higher lake levels caused by the modifications to Roosevelt were anticipated to provide benefits to eagles in the form of additional shallow water and lake fringe habitat. In turn, it was hoped that this improved habitat might provide sufficient production of prey to support a viable pair at both the Pinto and Pinal breeding areas (FWS 1990, p. 5). Subsequently, the Pinto female attracted a mate and the breeding area has become productive.



conservation measures were identified: 1) winter bald eagle surveys along the shores of Roosevelt, 2) additional nesting and perching platforms to replace cottonwoods killed by inundation in the Pinto breeding area, and 3) purchase of Rockhouse Farm property near the Salt River inlet to create riparian habitat (Reclamation 1992, p. 4). Reclamation supports winter bald eagle surveys at Roosevelt and subsequently purchased the irrigated fields and floodplain portions of the Rockhouse Farm<sup>18</sup> (Messing, pers. comm. 2002a).

### **2.4.3 1992/1993**

In 1992, Reclamation again reinitiated consultation with FWS following the discovery of a new bald eagle nest at the mouth of Tonto Creek in a grove of cottonwoods located below elevation 2,151 feet. Reclamation prepared a BA to address the impacts of Roosevelt modifications on this new breeding area and to address new information regarding the importance of reservoir inflow areas to bald eagles (Reclamation 1992, p. 5). The BA concluded there might be an impact on the Tonto bald eagles because trees in the vicinity would be killed by inundation of the NCS and eventually lost for perching or nesting. Recreation use at new facilities planned nearby might affect the bald eagles (Reclamation 1992, p. 23). At the conclusion of the reinitiated consultation with Reclamation, FWS determined that the Roosevelt modifications were not likely to jeopardize the continued existence of bald eagles in the Southwest (FWS 1993a, p. 2).

The 1993 BO prepared by FWS described the eventual loss of the existing nest trees and nests as a result of inundation, and the subsequent impact to trees, nests, productivity, eggs and fledglings from inundation and recreation impacts over the next 50 years (FWS 1993a, pp. 11, 12). The BO also noted there will be long-term offsetting effects as higher reservoir levels support cottonwoods at the inflow area relocated upstream and as habitat improves in the Tonto Creek Riparian Unit (FWS 1993a, pp. 9, 10). FWS stipulated three measures to minimize incidental take to the Tonto nest: 1) seasonal closure around the breeding area, 2) annual monitoring support for the Tonto breeding area, and 3) notification to FWS and assistance in rescue efforts if inundation of eggs or nestlings may occur (FWS 1993a, p. 12). The terms and conditions for the Tonto BO were for the life of the Indian Point recreation facility; or until the bald eagle is delisted; or until such time as it can be clearly demonstrated that the Tonto eagle breeding area has been abandoned; or until Reclamation can demonstrate that there have been no recreation-related incidents reported by nest watchers that resulted in abandonment of the nest or loss of young at the Tonto breeding area for 10 consecutive years (Messing, pers. comm. 2002a). These measures are being implemented by Reclamation. In addition, four conservation measures were identified: 1) relocation of the Indian Point Campground, 2) seasonal closure of the Indian Point Cultural Resource site, 3) establishment and maintenance of future potential nesting habitat along Tonto Creek including pole plantings of cottonwoods if necessary, and 4) construction and staffing of a bald eagle viewing station for public viewing and education (FWS 1993a, p. 14).

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<sup>18</sup> Reclamation purchased the Rockhouse Farm property in order to reduce liability from flood control operations (Messing, pers. comm. 2002).

## 2.4.4 1995/1996

In 1993, southwestern willow flycatchers were discovered nesting at the reservoir. The species was listed as endangered on March 29, 1995. Reclamation again requested Section 7 consultation with FWS on September 14, 1995 to consider the effect of modifications to Roosevelt Dam on flycatchers. The Biological Assessment prepared by Reclamation addressed the impact of the increased height of the dam, and the indirect effects of the inundation of the additional reservoir space, including flood control space, on flycatcher habitat (Reclamation and SWCA 1995, p. 1). On July 23, 1996, FWS issued a BO on the construction and operation of Modified Roosevelt and its effects on the endangered flycatcher. FWS anticipated in the BO that up to 90 flycatchers would be taken annually, which was based on the assumption that inundation of the flycatcher habitat would permanently eliminate all flycatcher habitat at Roosevelt. The BO identified an RPA to avoid jeopardy to the species, and RPMs and Terms and Conditions to minimize take and avoid jeopardy to the species. Reclamation is responsible for implementing the RPA and RPMs subject to the Terms and Conditions of the BO through October 1, 2006. Those measures and their status are listed in Table 1.

**Table 1. Reclamation reasonable and prudent alternative, measures, and terms and conditions for the flycatcher at Roosevelt and status of implementation.**

| RPA Measures   | Status   |
|--|--|
| <b>1.a. No fill of NCS until after 9/1/96 and completion of 1.b.</b>   | Conservation space not yet used due to drought.<br>Habitat acquisition for 1.b. complete.  |
| <b>1.b. Flycatcher Habitat Protection.</b> Acquisition, operation, and maintenance.  | Acquisition: \$1,460,563 for 865 acres. About \$100,000/yr in perpetuity for operation and maintenance. Site conservation plan completed in 1999 following review by FWS and Reclamation. Site conservation plan to be revised as needed. Perimeter fence completed in 1999. |
| <b>1.c. Management Fund of \$1.25M. Reclamation is planning to use the rest of the fund for land acquisition.</b><br>FWS 11/18/97 memo clarifies use of management fund. | A small amount of this fund was used for cowbird trapping on Upper San Pedro River, but was discontinued after 2 years because no flycatchers were found. The remainder of the fund will be used for land acquisition and habitat improvements along the San Pedro River.    |

| RPA Measures   | Status  |
|--|---|
| <b>1.d Reclamation Flycatcher Coordinator.</b> 10/1/1996-10/1/2006.  | Prepares annual work plan. Conducts coordination meetings among Reclamation, FWS, USGS, AGFD, quarterly or as needed. Assists FWS with coordination, interpretation, use of flycatcher research. Is an advocate for improving status of flycatcher: disseminates information, generates interest and seeks funding, accomplishes on-the ground conservation actions. Identifies conservation strategies in cooperation with FWS and other Federal, state, and Tribal entities for incorporation into a recovery plan; assists in assessing flycatcher distribution, site specific conditions, habitat and population trends, and potential management actions. Evaluates potential management conflicts, develops management opportunities and partnerships within occupied and unoccupied habitat. Coordinates with appropriate FWS staff to provide information for Section 7 consultation. Assists FWS in preparing management agreements with agencies, local management entities, and private land owners. The position is currently filled. |
| <b>1.e.1 and 3. Research and monitoring of nests and dispersal.</b><br>Monitoring at Roosevelt Lake and vicinity, lower San Pedro River, Gila River. Nest monitoring: 10 years at 5 sites. Dispersal monitoring (surveying): 5 years. Annual report. | Dispersal monitoring will continue beyond 5-year end date (2000 - 2002 depending on when surveys in a particular area began) because the Lake has not yet risen and a need exists to document change in flycatcher numbers when it does. In 2001, strategy was changed to monitor a predetermined subset of nests. The subset represents a variety of habitat cover gradations and distribution at Roosevelt Lake and San Pedro/Gila rivers and will provide statistically valid data.  |
| <b>1.e.2. Research and monitoring of demographic data.</b><br>Banding and dispersal at Roosevelt Lake, lower San Pedro, and Gila River populations for 5 years at 5 sites. 1996-2000. Annual report.   | Banding will continue beyond 5 year end date (2000) because the Lake has not yet risen and a need exists to document change in flycatcher numbers when it does. Decision made jointly by FWS and Reclamation during discussions in 2000. In 2001, strategy changed at San Pedro/Gila River. USGS will focus on banding birds used for nest monitoring at Roosevelt Lake. AGFD will band on the San Pedro/Gila rivers but will band only those individuals at monitored nests.   |
| <b>1.e.4. Genetic Sampling.</b> 1996, 1997   | Report completed in 1997.   |
| <b>1.e.5.a and b. Aerial Photos and Reports.</b> Photos to be taken in 1996, 1998, 2000.   | Color and infrared photos taken in the fall of 1996 and 2000. Reclamation scanned and rectified photos. SWCA completed report on 1996 aerial photos and 1996/97 vegetation mapping in 1999. SWCA vegetation mapping has been compared with ERO Resources habitat mapping.   |
| <b>1.e.5.c. Vegetation Sampling Report.</b> Reports due 1997, 2000, and 2006.  | Report will document changes in habitat extent, vegetation composition, and structure for each cover type. 1997 vegetation sampling report not completed because the draft report was unacceptable. FWS and AGFD agreed to substitute AGFD vegetation sampling at use and nonuse areas, as well as continuation of the AGFD habitat suitability model using 2000 satellite imagery and field truthing habitat status statewide. This work will also determine changes in habitat at Roosevelt Lake in 5 year increments beginning in approximately 1981.  |

| RPA Measures  | Status  |
|---|---|
| <b>1.f. Cowbird trapping</b> at 5 locations on lower San Pedro River for 10 years (1997- 2006). | Kearny, Indian Hills, San Pedro River Preserve, PZ Ranch, and Cooks Lake trapped through 2000. In 2001, traps moved from PZ Ranch to the mouth of Aravaipa Canyon on TNC property. Annual report is prepared. |
| RPMs, Terms and Conditions  | Status  |
| <b>1. Restrict fill of NCS through 9/1/96.</b>  | Complete.   |
| <b>2. Reduce cowbird parasitism.</b>  | Ongoing; see RPA 1.f.   |
| <b>3. Use skilled personnel for research and monitoring.</b>                                    | Ongoing. AGFD and USGS are conducting the research and monitoring.  |
| <b>4. Reduce take; provide coordination and management.</b>                                     | Ongoing; see RPA 1.d.   |

*Source:* Reclamation 2001; FWS 1996.

## 2.4.5 Summary of Reclamation's ESA Compliance

Reclamation's Section 7 consultations addressed the Federal action of "raising the dam's crest height 77 feet to increase the structural integrity of the dam and to allow for additional storage capacity and emergency flood control" (FWS 1996, p. 4). The 1983, 1990, and 1993 BOs addressed impacts on bald eagles, and the 1996 BO addressed impacts to flycatchers and authorized the incidental annual take of up to 90 flycatchers (FWS 1996, p. 43). After 2006 when Reclamation's intensive monitoring of flycatcher populations ceases, Reclamation's continued responsibilities under existing BOs will be limited to specific RPA measures described above for bald eagles and flycatchers unless changed circumstances occur related to the modifications of Roosevelt, or unless there is a new Reclamation action.

## 2.5 Forest Service Consultations

The Tonto National Forest requested formal consultation by FWS in 1995 for the Tonto Basin Allotment (including the Tonto Creek Riparian Unit) and the Eastern Roosevelt Lake Watershed Analysis Area (comprised of five separate grazing allotments) (G. Smith, pers. comm. 2002). These two project areas contained the entire known occupied flycatcher habitat at Roosevelt Lake at that time. BOs for each of these projects were issued by the FWS in December 1995. The BOs contained RPAs requiring cowbird trapping and flycatcher monitoring. Currently, livestock grazing is excluded in areas within 5 miles of occupied flycatcher habitat; therefore, the Tonto National Forest is no longer trapping cowbirds. The elimination of cowbird trapping, if livestock are excluded, conforms to the conditions of the BOs.

The Tonto National Forest has recently initiated NEPA compliance on the Tonto Basin, Poison Springs and Sierra Ancha Allotments, all of which contain occupied flycatcher habitat, and which were included in the 1995 consultation. It is anticipated that consultation with FWS under the ESA will occur for these allotments in late 2002 or

early 2003. The Forest also anticipates consulting on the remaining allotments that could potentially affect the flycatcher or its habitat between 2002 and 2004.

# **Chapter 3**

## **Alternatives Including the Proposed Action**

### **3.1 Introduction**

In formulating alternatives, the FWS and SRP reviewed written comments received during scoping, input from the Advisory Group, and information gathered during the HCP planning process. The comments and recommendations raised were considered in the development of reservoir operation alternatives and minimization and mitigation measures proposed in the RHCP.

The process for alternative development was somewhat unique because this draft EIS is addressing the continued operation of a facility that has been in operation for about 90 years rather than development of a new project. Thus, the formulation of the alternatives involved two components:

- The manner in which the existing Roosevelt Lake is operated, and
- The various measures to avoid, minimize, and mitigate possible biological, cultural, or socioeconomic impacts from reservoir operations.

The goal of providing for the conservation of federally listed and candidate species while permitting the continued operation of Roosevelt was determined to be attainable through various combinations of these components. Three alternatives, including the proposed action, a No Action alternative, and Re-operation alternative, were evaluated in detail. Other alternatives that included development of a replacement water supply for Roosevelt or alternative plans for Roosevelt and other SRP reservoir re-operation were considered, but these alternatives did not provide an adequate dependable supply of water or had other deficiencies. Various alternatives or methods to minimize or mitigate impacts to listed species and power supply also were considered.

This chapter includes a section on the formulation and evaluation of alternatives, a description of the three alternatives evaluated in detail, and alternatives that were excluded from further consideration. The environmentally preferred alternative is identified, and a discussion of whether the alternatives meet national environmental policy goals is provided. The last section of this chapter includes a summary comparison of the environmental impacts for each of the alternatives.

### **3.2 Formulation and Evaluation of Alternatives**

The FWS and SRP solicited and evaluated a wide variety of options and alternatives during development of the draft RHCP. A systematic screening process was used to identify alternatives to be evaluated in detail or to be eliminated from further

consideration. The primary factors used during the formulation, screening, and evaluation process were:

- Compliance with NEPA and the ESA
- Impacts on listed and candidate species
- Public input
- Impacts on water delivery and power generation
- Extent and feasibility of minimization and mitigation measures
- Results of prior ESA compliance for modifications to Roosevelt
- FWS guidance

Each of these factors is discussed below and applied in later sections of this chapter and in Chapter 4.

### **3.2.1 Compliance with NEPA and the ESA**

As described in Chapter 2, the issuance of an ITP is a Federal action requiring compliance with NEPA. NEPA guidelines emphasize that the primary purpose of the alternatives analysis in an EIS is to provide decision makers and the public with an objective comparison to evaluate the merits of different alternatives. Preferably, alternatives selected for analysis should be capable of either eliminating a project's significant adverse impacts or reducing them to a level of insignificance through mitigation. The No Action alternative should be considered along with a reasonable array of alternatives that are technically and economically feasible. In addition, the lead agency's (FWS) "preferred alternative" must be identified. The "environmentally preferable" alternative as defined in NEPA also should be indicated.

In addition to NEPA requirements for alternatives development and analysis, ESA requirements also were considered in the formulation of alternatives. The criteria for Section 10 permits described in Section 1.2 provided guidance for developing alternatives.

### **3.2.2 Impacts on Listed and Candidate Species**

The purpose of this draft EIS and the draft RHCP is to address the potential impacts of SRP's continued operation of Roosevelt on listed and candidate species. Thus, potential impacts on listed and candidate species are a primary factor in the development and consideration of alternatives. In particular, alternatives were evaluated in light of two ITP issuance criteria: 1) "the applicant will ... minimize and mitigate the impacts of such takings," and 2) "the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild" (50 CFR § 17.22). In other words, alternatives that would minimize and mitigate the impact of Roosevelt operations and that would maintain or improve the likelihood of survival and recovery of the species were given priority over alternatives that do not satisfy these ITP criteria.

### **3.2.3 Public Input**

Public input on alternatives was obtained from the Advisory Group established for the RHCP and through public notice and scoping (see Chapter 1). Alternatives suggested by the public included:

- Changes in reservoir operation at Roosevelt or other SRP dams
- No change in reservoir operations
- Greater management of livestock grazing
- Conservation of alternative riparian habitat
- Utilization by SRP and the cities of water supplies other than from Roosevelt

### **3.2.4 Impacts on Water Delivery and Power Generation**

As described in Chapter 2, SRP operates Roosevelt in conjunction with other components of its water supply system to generate hydropower and to provide water to members, cities, Indian communities, and other users in the Salt River Valley. SRP water deliveries are made pursuant to numerous water rights and contracts dating back over a century. The primary purpose of Roosevelt Dam since its authorization in 1903 has been to maximize the conservation of water — to store water in times of high runoff for use during times of low runoff, and to generate power as the water is released for downstream uses. Thus, any alternative that does not permit maximizing water storage in Roosevelt would result in adverse effects to water and power users. Higher priority was given to alternatives that minimize impacts to water and power supplies.

### **3.2.5 Extent and Feasibility of Minimization and Mitigation Measures**

The ESA requires habitat conservation plans to minimize and mitigate the impacts of taking listed species to the “maximum extent practicable” (50 CFR § 17.22). As part of the evaluation of alternatives, a comprehensive list of potential impact minimization and mitigation measures at Roosevelt and then in an ever-widening radius from Roosevelt was developed. First, except for measures associated with the prior Section 7 consultation for construction of Modified Roosevelt, measures that are subject to Section 7(a)(1) and (2) of the ESA were eliminated from further consideration because Federal agencies already have a duty to manage these lands for listed species. Second, the remaining minimization and mitigation measures were prioritized with highest priority being given to measures at or close to Roosevelt, with diminishing priority as distance from the reservoir increases. Finally, the feasibility of the high priority measures was evaluated and those measures that were found to be impracticable or not cost-effective were eliminated from further consideration.



### 3.2.6 Results of Prior ESA Compliance for Modifications to Roosevelt

In a 1996 BO on Modified Roosevelt, FWS provided an incidental take statement for the construction and eventual inundation of newly constructed storage space at Roosevelt Lake to an elevation of 2,151 feet with the implementation of an RPA involving habitat acquisition and protection, other conservation measures, and satisfaction of certain terms and conditions (FWS 1996). As described in Section 2.4.4, RPAs and terms and conditions of the BO included offsite protection of riparian habitat, establishment of a management fund, and research and monitoring. A variety of alternatives were evaluated during this previous consultation process. The BO considered and rejected four of those alternatives after analyzing their merits. These four alternatives and the reasons for their rejection were reconsidered during development of the RHCP to verify whether they should continue to be eliminated from further consideration. One previously rejected alternative, creation of new riparian habitat in upland areas near Roosevelt using irrigation, is included as part of the RHCP. The other three alternatives (reservoir management to enhance riparian habitat, creation of new riparian habitat along the abandoned power canal, and creation of new riparian habitat by creating spoil islands) were rejected for the same reasons set forth in the BO, that is, they are either infeasible or unlikely to result in suitable riparian habitat that is likely to be used by flycatchers (FWS 1996, pp.28, 29).

### 3.2.7 FWS Guidance

Regular meetings between FWS and SRP have occurred since January 2001. Meetings directly involving FWS to discuss development of the RHCP were held on January 11, February 27, March 27, April 30, June 12, August 7, August 21, September 20, October 23, November 5, November 27, and December 18, 2001; January 31, February 19-20, March 13-14, April 11-12, May 2, May 30-31, and June 26, 2002. At these meetings, FWS responded to questions from SRP by providing guidance. This guidance included input into the development and evaluation of alternatives.

### 3.2.8 Selected Alternatives

Following review and discussion of a wide range of alternatives, three primary alternatives, including no action, were considered for evaluation in the EIS:

- **Alternative 1—No Permit Alternative (No Action by FWS)** — No issuance of a Section 10 Permit (ITP) by FWS. Under this alternative SRP would do everything within its control to avoid any take of federally listed species associated with its continued operation of Roosevelt.
- **Alternative 2—Full Operation Alternative (Proposed Action)** — Issuance of an ITP by the FWS allowing the continued operation of Roosevelt by SRP consistent with pre-permit operational objectives for full operation of the reservoir up to the maximum storage elevation of 2,151 feet. This alternative includes implementation of the RHCP measures to minimize or mitigate the potential take of federally listed species.

- **Alternative 3—Re-operation Alternative** — Issuance of an ITP by FWS authorizing the modified operation of Roosevelt to reduce the short-term impact of reservoir operations on listed and candidate species. This alternative includes measures to minimize or mitigate the potential take of federally listed species.

Each alternative under consideration is discussed in more detail in the following sections.

### **3.3 Alternative 1 — No Permit (No Action by FWS)**

Under the No Permit alternative, FWS would not issue an ITP to SRP for continued operation of Roosevelt. Without an ITP, SRP would be expected to do everything within its control to avoid take of federally listed species associated with operation of Roosevelt.

#### **3.3.1 Roosevelt Operation**

To avoid the risk of potential take of listed species, Roosevelt would have to be operated to avoid extended inundation of riparian vegetation that is currently used by federally listed and candidate species. The maximum reservoir elevation would be limited to an elevation of 2,095 feet to avoid impacts to vegetation used by these species unless a large runoff event occurred that could not be immediately passed through the reservoir.

Flycatchers currently use vegetation for breeding and nesting at lower levels of the exposed lakebed, whereas eagles forage over the open water of the reservoir and use habitat on the margins of the reservoir for roosting and nesting. A Yuma clapper rail has been found in a cattail marsh along Tonto Creek near an elevation of about 2,000 feet. Cuckoos use habitat at the mid- and upper elevations of the lakebed. It is likely that cuckoos and flycatchers use many of the same habitat patches. The base of the lowest trees and shrubs supporting existing flycatcher nests or territories was near elevation 2,088 feet in 2001. Flycatchers typically nest 10 to 16 feet above the base of trees at Roosevelt. In order to ensure that there would be no impact on the lowest nest or territory, the No Action alternative would require SRP to attempt to maintain reservoir levels below 2,095 feet after May 1.<sup>19</sup> A maximum elevation of 2,095 feet near the beginning of the nesting season ensures that inundation of the root crown of existing nest trees would be less than a few months, which would not affect nest tree survival and would be unlikely to affect nesting success. Although the specified elevation of 2,095 feet would occasionally be exceeded due to high runoff, the reservoir level would be lowered to the specified elevation as soon as physically feasible consistent with flood control and dam safety operational requirements.

Flood pool storage capacity in Roosevelt would increase about 900,000 AF if the maximum conservation storage capacity is held to an elevation of 2,095 feet. As a result,

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<sup>19</sup> Although this elevation may be lower in 2002, that information will not be known until late summer. If the lowest nest is at a significantly lower elevation, the maximum lake level would be correspondingly lower.

the criteria established in the Modified Roosevelt Water Control Manual (Corps 1997) may have to be revised to develop new operational parameters. SRP would operate Roosevelt in accordance with revisions to the Water Control Manual, if any; however, changes in flood control operations that affect federally listed species would be subject to consultation under Section 7 of the ESA by the U.S. Army Corps of Engineers.

### **3.3.2 Actions to Minimize, Mitigate, and Monitor the Effects of Roosevelt Operations**

No new minimization, mitigation, or monitoring measures would be implemented with the No Permit alternative other than limiting the reservoir level to 2,095 feet subject to physical constraints. Implementation of the No Permit alternative does not mean that there would be no loss of riparian vegetation used by flycatchers, bald eagles, and cuckoos. Periodically, some loss of vegetation from inundation is likely to occur with this alternative because of limits in the structural release capability of the dam.<sup>20</sup> Without the long-term cycle of large fluctuations in reservoir level, much of the existing riparian vegetation on the lakebed would dry out. Riparian vegetation would be confined to relatively narrow bands along Tonto Creek and the Salt River near an elevation of 2,095 feet and possibly in scattered locations on the lake shoreline above the maximum lake level. In addition, lower reservoir levels would result in a greater potential for vegetation along the Salt River and Tonto Creek inflow points to be periodically scoured during floods without higher reservoir levels to attenuate flood flows. As discussed in Chapter 4, the riparian ecosystem at Roosevelt is very dynamic and subject to periodic modification depending on the amount, timing, and intensity of precipitation.

## **3.4 Alternative 2 — Full Operation of Roosevelt (Proposed Action)**

The Full Operation alternative is the proposed action by SRP and the FWS preferred alternative. This alternative would involve issuance of an ITP by the FWS authorizing the continued full operation of Roosevelt with the implementation of the RHCP, consistent with pre-permit objectives set forth in Section 1.2. The intent of this alternative is to minimize the biological, environmental, and socioeconomic impacts from future reservoir operations, continue water storage and power generation at Roosevelt, and satisfy the criteria of Section 10 of the ESA.

The RHCP covers the area within Roosevelt Lake up to an elevation of 2,151 feet and the potential take of the endangered southwestern willow flycatcher, Yuma clapper rail, the threatened bald eagle, and the candidate yellow-billed cuckoo should it become listed. Measures to minimize and mitigate effects of incidental take of these from future SRP operation of Roosevelt are included in the RHCP. These impacts would result from harm through periodic inundation or drying out of listed species habitat resulting in the loss of

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<sup>20</sup> Maximum release capacity between elevation 2,095 feet and 2,115 feet is about 12,000 cfs. Above elevation 2,115 feet, release capacity increases from about 23,000 cfs at elevation 2,120 feet to about 110,000 cfs at elevation 2,150 feet.

productivity. Effects would include those to existing habitat as well as to habitat that may exist in the future. Since future conditions are difficult to predict, the approach in the RHCP is to predict the maximum likely impacts in any given year and to provide contingent mitigation to reduce the possibility that take will exceed permitted levels. The maximum anticipated take of occupied habitat is 1,250 acres for flycatchers, 10 acres for Yuma clapper rails, and 1,113 acres for cuckoos. The maximum anticipated take of bald eagles over the life of the permit is 18 fewer fledglings due to reduced productivity as a result of low reservoir levels. Anticipated take for bald eagles associated with potential loss of nest or perch trees also is addressed.

SRP is applying for an ITP for a period of 50 years extending from the date that a permit is issued, which, if issued, is anticipated near the end of 2002. The decision to pursue a permit for a 50-year period is based on several considerations. First, 50 years is the period of time necessary to provide adequate certainty of future water supplies to SRP in order to commit the funding required for the proposed conservation measures in the RHCP. Second, the implementation of proposed mitigation measures including habitat acquisition, management, and monitoring are long-term commitments to protect and preserve riparian habitat for the covered species. Third, the analyses of impacts in the RHCP are predicated on the long-term pattern of fill and release for the reservoir and the effects that continued reservoir operations would have on the habitat available to the listed and candidate species and their long-term survival.

### **3.4.1 Roosevelt Operation**

Under this alternative, Roosevelt would continue to be operated by SRP as part of its reservoir system in a manner consistent with its purpose as a water storage and power generation facility. SRP would operate Roosevelt and other SRP reservoirs to minimize spills of water past Granite Reef Dam according to the Modified Roosevelt Dam Operating Agreement (see Appendix 1 of the RHCP), with the following objectives:

- Maintain the safety and integrity of the dams.
- Maintain sufficient storage to meet water delivery obligations.
- Optimize reservoir storage within the reservoir system.
- Maintain adequate carryover storage in case of low runoff.
- Conjunctively manage ground water pumping given reservoir storage and projected runoff and demand.
- Maximize hydrogeneration.
- Operate to permit necessary facility maintenance

SRP also would continue to operate Roosevelt to control floods in accordance with criteria established in the Modified Roosevelt Water Control Manual (Corps 1997, p. vii). However, operation of the flood control space above elevation 2,151 feet in Roosevelt is not covered by the RHCP. Any future changes in flood control operations that would affect listed species would be the subject of consultation under Section 7 of the ESA by the Army Corps of Engineers because SRP does not have discretion over operation of that space.

SRP's operation of Roosevelt in future years may require periodic removal of dead trees that result from inundation. Clearing of dead vegetation may be required in order to permit effective operation of spillways and outlet works, or to minimize safety issues with recreational use of the lake by boaters. If these operational or safety concerns necessitate removal of dead trees, SRP would meet with FWS to agree on the specific method (e.g., controlled burns or mechanical clearing) and the specific areas for vegetation clearing (e.g., areas near occupied habitat would be avoided).

### **3.4.2 Actions to Minimize, Mitigate, and Monitor the Effects of Roosevelt Operations**

In conjunction with the proposed action of full operation of Roosevelt, measures to minimize and mitigate the potential take of federally listed species would be implemented by SRP. Mitigation measures would include acquisition and management or restoration of riparian habitat at and near Roosevelt, along the Verde, San Pedro and Gila rivers, or elsewhere in central and southern Arizona. A comprehensive description of actions to minimize, mitigate, and monitor the effects of Roosevelt operation is included in the RHCP. An abbreviated discussion of key minimization and mitigation measures follows, beginning with a discussion of how the RHCP integrates prior Section 7 consultations between Reclamation and FWS for construction of Modified Roosevelt Dam and the relationship of the RHCP to the Southwestern Willow Flycatcher Recovery Team's current recommendation for a recovery plan for flycatchers (FWS 2001b). The eight specific minimization and mitigation measures that would be implemented under the RHCP are described, followed by a discussion of the funding assurances and monitoring measures. A discussion of the additional assurances requested from FWS and the proposed treatment of unforeseen or changed circumstances concludes the summary of minimization and mitigation measures.

#### ***3.4.2.1 Integration with Prior Section 7 Consultations for Modified Roosevelt***

The most recent Section 7 consultation between FWS and Reclamation, completed in 1996, addressed Reclamation's modifications to Roosevelt Dam, and the effects of the eventual inundation of the new conservation, flood control and flood surcharge space made possible by the modifications.<sup>21</sup> The 1996 BO, prepared by FWS at the conclusion of the consultation process, estimated that inundation of the NCS would destroy riparian vegetation used for nesting by southwestern willow flycatchers, resulting in the take of as many as 90 flycatchers annually. FWS concluded that, absent the implementation of the RPA set forth in the BO, the proposed action was likely to jeopardize the continued

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<sup>21</sup> In 1996, the effect of inundation of the flood control and flood storage space (i.e., above 2,151 feet) resulting from modifications to Roosevelt was determined to have no significant impact on biological resources, including listed species, that had not already been addressed under Section 7 of the ESA (Reclamation 1996a, pp. 2, 28, 29). SRP indicates that it is not aware of any change of circumstance or new information that would alter that conclusion. The flood control and flood storage space is not part of the RHCP.

existence of the flycatcher. With the implementation of the RPA, which required, among other things, the purchase and management in perpetuity of substitute habitat for the flycatcher, the FWS determined that construction of Roosevelt modifications could go forward without violating Section 7(a)(2) of the ESA. As part of its BO, FWS issued an Incidental Take Statement permitting the annual take of up to 90 flycatchers at Roosevelt resulting from inundation of the NCS.

The RPA set forth in the 1996 BO also required Reclamation to monitor the population of flycatchers at Roosevelt for a 10-year period. In accordance with this requirement, Reclamation, through cooperative agreements with the Biological Resources Division of the U.S. Geological Survey and the Arizona Game and Fish Department, has conducted annual surveys and nest monitoring of the population of flycatchers at Roosevelt. The results of these surveys reveal that, since 1996, the total number of flycatchers at Roosevelt has increased to well over 90 birds. The nesting locations of the flycatchers at Roosevelt have also changed. Due to drought conditions in Central Arizona over the last 5 years, water levels in the reservoir have declined and riparian vegetation has grown into intermittently dewatered areas of the reservoir, at elevations below the NCS. In the spring of 2001, there were few flycatchers nesting in riparian vegetation in the NCS; instead, the nests were located lower down in the reservoir, closer to the surface elevation of the lake, which in the spring of 2001 reached approximately 2,092 feet.<sup>22</sup>

There is, therefore, no immediate threat of take of any flycatchers in the NCS. It is possible that the increased population of flycatchers could move into the NCS with rising lake levels, and that subsequent filling of the space could result in the take of flycatchers in an amount greater than that specified in the 1996 BO and Incidental Take Statement. Recognizing these changed circumstances and in order to integrate the conservation measures specified in the 1996 BO with those that would be implemented as part of the RHCP, Reclamation has informed SRP that it intends to request reinitiation of formal consultation with FWS on the effects of Reclamation's action of modifying Roosevelt Dam in conjunction with FWS consideration of SRP's application for an ITP (Ellis, pers. comm. 2001; see 50 C.F.R. §§ 402.16(a) and (c)).

As with flycatchers, previous Section 7 consultations addressed the effects of Reclamation's actions to modify Roosevelt Dam on bald eagles (see Chapter 2). Reclamation's implementation of the RPAs in those BOs addresses any incidental take of bald eagles resulting from construction of the modifications.

Both the current RHCP and the previous BOs address the effects of inundation of riparian vegetation in the NCS on the flycatcher and bald eagle. These BOs considered these effects as an eventual result of Reclamation's action of constructing the NCS at Roosevelt Dam. The RHCP considers these effects as an integral aspect of SRP's long-term operation of all of the conservation storage space at Roosevelt. The effects of inundation and drying of flycatcher habitat in both the NCS and the original conservation space, as well as the effects of inundation of bald eagle nest trees and impacts of reservoir

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<sup>22</sup> In 2001, the majority of nests were located in trees and shrubs with root crowns (base of the vegetation) between elevations 2,095 and 2,120 feet.

drawdown on bald eagle productivity resulting from the storage of water by SRP, are considered and addressed as part of the RHCP. Moreover, the RHCP, together with the RPAs and RPMs developed by FWS in its previous BOs and implemented by Reclamation, will minimize and mitigate, to the maximum extent practicable, any “take” of listed species resulting from the operation of conservation storage at Roosevelt Dam. Furthermore, SRP believes the RHCP will ensure that continued operation of Roosevelt will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. When implemented along with the existing RPAs and RPMs from prior BOs, the RHCP is intended to provide a comprehensive plan to address impacts on listed and candidate species, and alleviate any need for additional conservation measures by Reclamation as a result of the reinitiated Section 7 consultation.

#### ***3.4.2.2 Relationship of the RHCP to the Southwestern Willow Flycatcher Recovery Team’s Recommendation***

The Southwestern Willow Flycatcher Recovery Team issued its current recommendation for a recovery plan (Recommendation) to the Regional Director of the FWS in April 2001 (FWS 2001b). The Recommendation was used as a source of information and guidance in preparation of the RHCP. However, because it is in draft form, the Plan is not the official position of FWS until approved by the Regional Director of the FWS (FWS 2001b, p. i). It is expected that a number of changes will be made in the Plan before it becomes final (Leon and Finch, pers. comm. 2001). Therefore, the Recommendation was only relied upon for general guidance and the proposed RHCP is generally consistent with the Recommendation as discussed below.

Management Units within broader Recovery Units are the basic geographical components of the Recommendation (FWS 2001b, pp. 63-65). Roosevelt Lake lies within the Roosevelt Management Unit in the Gila Recovery Unit (Id.; pp. 65, 67, Figure 4; and Table 10). The Roosevelt Management Unit encompasses the Salt River watershed upstream from the confluence with the Gila River west of Phoenix to the Mogollon Rim at the top of the basin, except for the Verde River watershed (which was designated as a separate Management Unit). Based on a population viability analysis, the Gila Recovery Unit was determined to be a relatively stable metapopulation (Id.; p. 73). The model used in the analysis indicates that removal of the Roosevelt flycatcher population from the Gila Recovery Unit would only cause a slight decrease in the equilibrium occupancy rate (which is 77 percent to 75 percent) in the Gila Recovery Unit because it is relatively isolated from other colonization sites (Id., p. 73).

Tentatively, the Recommendation sets the recovery criteria for the entire Roosevelt Management Unit at 50 territories (or at least 80 percent of that number if the overall goal in the Gila Recovery Unit is met). Although there are other areas that may eventually be occupied by flycatchers in the Roosevelt Management Unit, all of the currently known flycatchers in this Unit are located at Roosevelt. To further the flycatcher recovery goals, the RHCP incorporates specific efforts to establish, acquire, and manage suitable riparian habitat in the Roosevelt Management Unit.

The Recommendation suggests, “compensation habitat should be acquired at no less than a 3:1 ratio” (FWS 2001b, p. 81). This guidance is in the context of permanent

habitat loss, modification, fragmentation, or degradation (Id.). For the RHCP, a similar level of mitigation will be achieved through: 1) acquisition and management of at least twice as much riparian habitat as will be impacted at Roosevelt plus additional mitigation measures to conserve and improve riparian habitat; and 2) habitat management and water acquisition. In addition, mitigation measures to be implemented as part of the RHCP include staff positions for habitat management, monitoring, funding guarantees, and other measures as described in this section.

The Recommendation includes recovery actions that are believed to be important to flycatcher recovery where feasible, legal and effective (FWS 2001b, pp. 89 to 116). Although the RHCP is not required to contribute to the recovery of listed species, efforts to be consistent with the Recommendation and to provide benefits to the species are included. A comparison of key recovery actions from the Recommendation along with corresponding proposed RHCP conservation measures is included in Table 2.

The minimization and mitigation measures included in the RHCP reflect these guidelines by focusing on conservation of riparian habitat that is used or may be used by flycatchers and that is as close to Roosevelt as possible, using best efforts to conserve the mitigation sites prior to permit issuance, funding ongoing management of the conserved habitat, and focusing on priorities for acquisition outlined in existing documents.

The RHCP is required by law to ensure that the incidental take under the ITP will minimize and mitigate impacts on listed species to the maximum extent practicable and will not appreciably reduce the likelihood of the survival and recovery of the species in the wild (ESA Section 10(2)(B)(iv); 50 C.F.R. § 17.22(b)(2); FWS 1996, p. 3-20). As discussed below, the RHCP meets this criterion by proposing to implement minimization and mitigation measures.

#### ***3.4.2.3 Minimization and Mitigation Measures***

Proposed minimization and mitigation measures to be undertaken as part of the RHCP are described in this section and were prioritized based on: (1) maximization of benefits to listed species; (2) minimization of impacts on water delivery and power generation; (3) proximity of the mitigation sites to Roosevelt; and (4) feasibility of the proposed measures. Highest priority is given to minimization and mitigation measures that would offset impacts to flycatchers. Benefits to Yuma clapper rails, bald eagles, and cuckoos also are a component of mitigation measures. Proposed mitigation areas included in the RHCP are numbered in order of priority as shown in Figure 8 and described in Table 3. Conservation measures for listed and candidate species are described below.

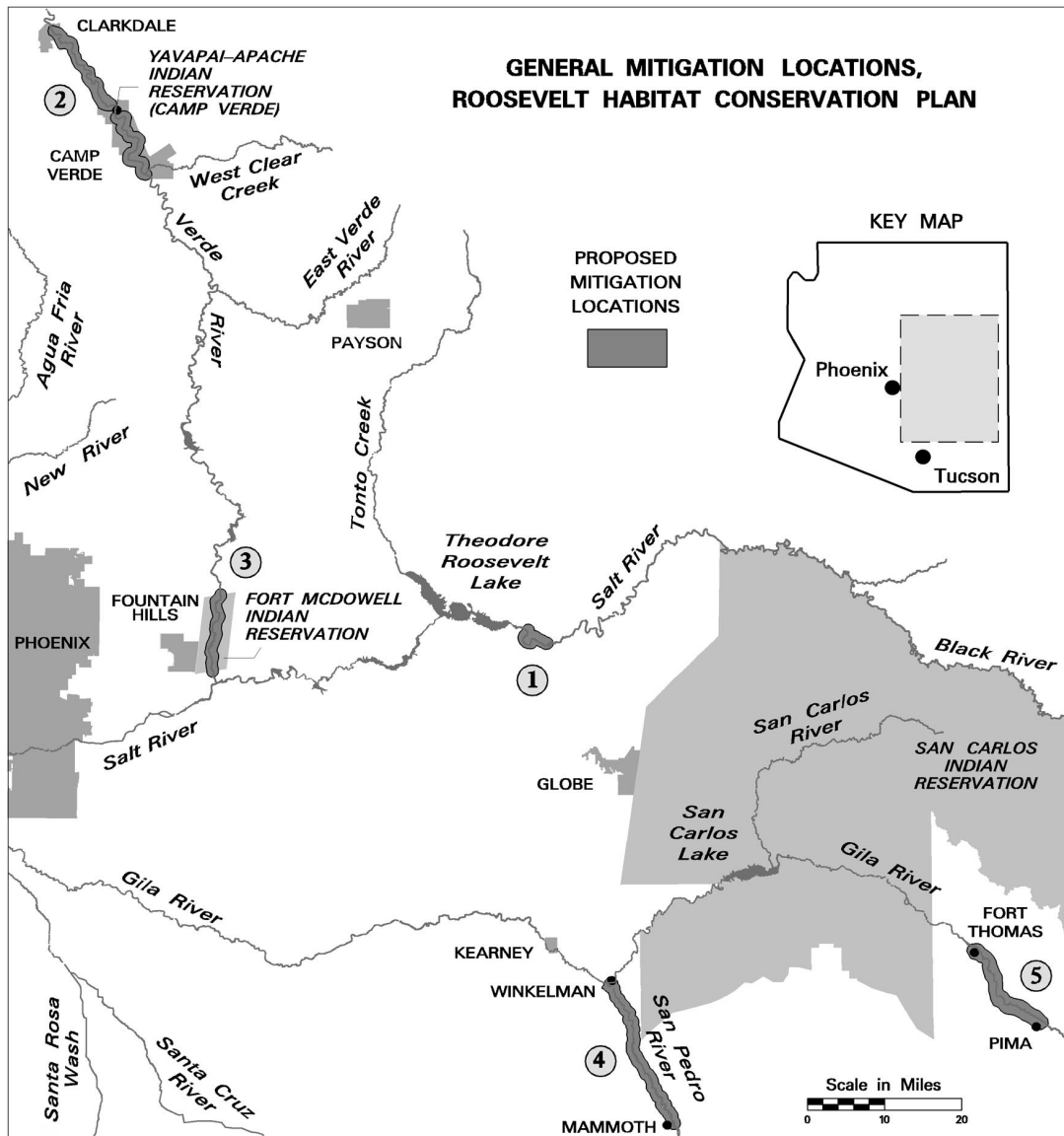
SRP will implement adaptive management as part of the RHCP in the event that certain thresholds of potential impact to flycatcher, Yuma clapper rail, and cuckoo habitat are exceeded at Roosevelt in the future. Adaptive management for potential effects on bald eagles is not necessary because the mitigation measures in the RHCP address all foreseeable changes in circumstances. The monitoring measures to determine if adaptive management measures need to be implemented are provided later in this section.



**Table 2. Comparison of flycatcher recovery recommendations and RHCP conservation measures.**

| <b>Recommended Guidelines and Recovery Actions</b>  | <b>RHCP Conservation Measures</b>   |
|---|---|
| Maintain and augment existing populations prior to loss and replacement elsewhere   | <ul style="list-style-type: none"> <li>• Protection and management of existing habitat at Roosevelt, and acquisition of habitat along the Verde, San Pedro, and Gila rivers, or elsewhere in central and southern Arizona</li> </ul>  |
| Establish habitat close to existing breeding sites and preferably within the same Management Unit (or at least the same Recovery Unit).<br>Prioritize habitat acquisition by: 1) occupied, unprotected, 2) unoccupied, suitable, unprotected, and 3) potential habitat, unprotected | <ul style="list-style-type: none"> <li>• Protection and management of riparian habitat at Roosevelt</li> <li>• Creation of riparian habitat on Salt River</li> <li>• Acquisition of habitat along the Verde, San Pedro, and Gila rivers, or elsewhere in central and southern Arizona near existing breeding sites</li> </ul>   |
| Compensation habitat should be at a 3:1 ratio   | <ul style="list-style-type: none"> <li>• Compensation for impacts to flycatcher habitat will be at 3:1 based on acquisition and management of high quality riparian habitat and adjacent buffers, habitat management at Roosevelt, water acquisition and other measures. Compensation would focus on large scale habitat protection rather than small isolated parcels. There would not be a permanent loss of habitat at Roosevelt. These measures would also benefit cuckoos, Yuma clapper rails, and possibly eagles.</li> </ul> |
| Modifying dam operations  | <ul style="list-style-type: none"> <li>• Examined in RHCP and EIS, full operation was selected as the most biologically effective alternative that minimizes socioeconomic impacts and satisfies legal obligations for SRP water delivery</li> </ul>  |
| Augmenting sediment downstream of reservoirs  | <ul style="list-style-type: none"> <li>• Examined, but determined to be ineffective, unpredictable, and expensive</li> </ul>  |
| Provide more water to riparian areas  | <ul style="list-style-type: none"> <li>• RHCP includes acquisition and management of water rights to benefit riparian areas along the San Pedro River or elsewhere</li> </ul>   |
| Improve fire, recreation, livestock management  | <ul style="list-style-type: none"> <li>• Management plans would address these issues at the mitigation sites. SRP will fund a Forest Service position at Roosevelt to protect, enhance, and maintain habitat</li> </ul>   |
| Protect habitat   | <ul style="list-style-type: none"> <li>• Acquired habitat would be protected and managed in perpetuity for the benefit of flycatchers</li> </ul>  |
| Increase population stability   | <ul style="list-style-type: none"> <li>• Mitigation sites selected to enhance and increase populations</li> </ul>   |
| Adequate funding for mitigation habitat   | <ul style="list-style-type: none"> <li>• SRP funding commitments included in the RHCP and Implementing Agreement</li> </ul>   |
| Monitor populations and habitat   | <ul style="list-style-type: none"> <li>• SRP will provide for monitoring of compliance and effectiveness throughout 50-year ITP</li> </ul>  |

Figure 8. Locations of Proposed Mitigation Sites.



**RHCP Conservation Measures for Flycatchers.** SRP will implement a number of conservation measures as part of the RHCP in order to minimize and mitigate the anticipated maximum impact of 750 acres of occupied flycatcher habitat (as discussed in Chapter 4) from continued full operation of Roosevelt. Mitigation measures for the estimated 750 acres of impact to flycatcher habitat include a 2:1 component of habitat acquisition and management (1,500 acres) and a 1:1 component of additional conservation measures (750 acres) as described below. Adaptive management would be used if impacts to occupied habitat exceed 750 acres due to changed circumstances for up to an additional 500 acres of future impact. These measures, along with the schedule for implementation, and proposed adaptive management measures are described below.

*Habitat Acquisition and Management.* One component of the mitigation encompassed in the RHCP is to permanently acquire and manage at least 1,500 acres of riparian habitat by fee title or conservation easements. This component also includes management of currently occupied flycatcher habitat or habitat that, through improved management, is expected to support flycatchers in the future (Table 3).

**Table 3. Existing and proposed minimization and mitigation sites for flycatchers, Yuma clapper rails, bald eagles, and cuckoos.**

| Site                          | Acreage   | Comment   |
|-------------------------------|---|---|
| Salt Arm (Rockhouse)          | About 20 acres  | <ul style="list-style-type: none"> <li>High priority site</li> <li>Pilot project of 20 acres will be established and evaluated</li> <li>Project will be expanded up to 75 acres if feasible and needed for adaptive management</li> </ul>   |
| Roosevelt                     | About 300 acres   | <ul style="list-style-type: none"> <li>High priority site</li> <li>Management and protection of existing riparian habitat at Roosevelt</li> </ul>   |
| Verde Valley                  | Up to 160 acres <sup>†</sup>                                      | <ul style="list-style-type: none"> <li>High priority site for acquisition and management of riparian habitat</li> <li>Acquisition of buffer land and water rights in proximity to off-site mitigation lands</li> </ul>  |
| San Pedro and Safford Valleys | Up to about 950 acres by SRP <sup>†</sup>                         | <ul style="list-style-type: none"> <li>High priority sites for acquisition and management of riparian habitat</li> <li>Acquisition of buffer land and water rights in proximity to off-site mitigation lands</li> </ul>   |
|                               | About 620 acres by Reclamation <sup>†</sup>                       | <ul style="list-style-type: none"> <li>Riparian habitat already acquired (403 acres of riparian habitat and 220 acres of other conservation measures)</li> </ul>  |
|                               | About 200 acres by Reclamation <sup>†</sup>                       | <ul style="list-style-type: none"> <li>Riparian habitat to be acquired</li> </ul>   |
| Elsewhere                     | Balance of habitat and other measures needed to reach 2,250 acres | <ul style="list-style-type: none"> <li>Acquisition and management of riparian habitat in other areas in central Arizona will depend on whether sufficient mitigation habitat is obtained in the five sites listed above.</li> <li>Acquisition of water right and buffer land in proximity to off-site mitigation lands</li> </ul> |

<sup>†</sup>Additional riparian habitat would be protected if not feasible at other sites.

The amount of riparian land to be protected and managed is based on a number of considerations:

- Much of the acquired habitat would be initially unoccupied and may never achieve the densities of birds found at Roosevelt.
- A lag time may exist between acquisition/easements and improvement of the suitability of the habitat through management.
- There would not be a permanent loss of habitat at Roosevelt. Over the long-term, the average annual amount of vegetation suitable for nesting at Roosevelt is estimated to be 300 to 400 acres and there would be habitat along the lake fringe near the Tonto Creek and Salt River inflow points at full reservoir levels. Future potential habitat at Roosevelt is not included in the 1,500 acres of off-site mitigation.
- SRP is including additional measures such as funding staff time for habitat management at Roosevelt, water management/water rights acquisition along the San Pedro (or elsewhere if needed) as described below.
- Unlike small projects mitigating for a few acres of impact, the scale of mitigation in the RHCP is relatively large involving hundreds of acres of riparian land, which provide better quality blocks of habitat.
- SRP is seeking to protect the highest quality riparian habitat available within proximity to Roosevelt, not marginal habitat. SRP is pursuing properties on the Verde, San Pedro, Gila, and other rivers that create a synergism with other conservation efforts to provide a greater overall benefit to wildlife.
- The riparian habitat to be acquired and managed would have characteristics similar to the 750 acres to be lost at Roosevelt Lake. Patches of riparian habitat targeted for acquisition would be occupied by flycatchers or would have similar or greater proportions of tall, dense woodland as that lost, i.e., at least 60 percent on average and would have moist soil or patches of surface water during the nesting season.
- SRP would be acquiring and restoring habitat along several rivers where there are already flycatchers nesting. This would increase the area along those corridors for colonization and movement and avoids the problem of having so many “eggs in one basket” where a fire, flood or other disaster could eliminate most or all of the habitat all at once.

Incorporated into the RHCP are the on-going habitat protection measures resulting from the construction of Modified Roosevelt Dam. The San Pedro Preserve, which was purchased by Reclamation as mitigation for the construction of Modified Roosevelt, contains about 403 acres of riparian habitat suitable for flycatchers (SRP 2002c) and Reclamation is pursuing an additional 200 acres of suitable habitat with the remainder of the management fund established under the RPA (Table 4). Thus, the RHCP includes 900 acres of newly created, protected or enhanced flycatcher habitat in addition to the 600 acres Reclamation would protect. Should Reclamation acquire less than 600 acres of flycatcher habitat, SRP would be responsible for acquiring the balance up to 1,500 acres.

SRP may also receive habitat credit for funding the permanent management of flycatcher habitat acquired by state, Federal, or conservation organizations. Habitat credit would be in proportion to the total cost of land acquisition and management.

A manager for all acquired properties would be identified and a management plan would be developed, implemented, and permanently funded to ensure management or development of riparian habitat characteristics in perpetuity. SRP would develop a management plan for each property within one year of habitat acquisition in coordination with FWS and, where applicable, the management entity. The management plan would require FWS approval. The core elements of each management plan are as follows:

- Place a conservation easement on the mitigation property
- Collect baseline data on physical and biological attributes
- Establish management goals
- Develop and implement strategies to achieve the management goals
- Monitor flycatchers, cuckoos, riparian vegetation, and overall condition of the property
- Evaluate management success
- Review annually and amend the plan if necessary

*Additional Conservation Measures.* In addition to the habitat protection and management described above, the RHCP provides for additional conservation measures equivalent to 750 acres. These additional measures may take a variety of forms, including: 1) protection and management of riparian habitat at Roosevelt; 2) where feasible and appropriate, protection and management of upland buffers to minimize threats to protected habitats; 3) acquisition of water rights and reduced diversion or ground water pumping, with concomitant benefits to riparian habitat; and 4) and other measures approved by FWS. The buffer and water right land acquired by Reclamation under the 1996 BO is credited using the same methods described below.

SRP's funding of protection and management personnel at Roosevelt will be divided by the average cost per acre of acquisition and management of riparian land along the San Pedro River to determine the number of acres of long-term Roosevelt habitat to be credited under Additional Measures. The amount of credit for this measure is estimated to be 300 acres (Table 4).

The need and extent to acquire and manage upland buffers, as well as credit for those buffers, will be agreed upon by FWS and SRP on a case-by-case basis. The primary purpose of buffers is to help insulate riparian habitat from impacts of adjacent land uses. It is anticipated that upland buffers will be less than 10 percent of the aggregate of acquired riparian habitat.

Mitigation credit for acquisition of water rights and reduced diversion or ground water pumping would be defined by the amount of historical water use retired. Water measures would be implemented adjacent to or upstream of conserved habitat, which would benefit habitat from flow augmentation provided by the water rights acquisition or reduced pumping. The amount of water retired will be measured by the acre-feet (AF) of

historical annual depletion of water by irrigation or other uses divided by 2 AF per acre for the average annual depletion of moderate to dense riparian vegetation. As part of the mitigation for construction of Modified Roosevelt, Reclamation retired about 164 acres of irrigated land and ponds on the San Pedro Preserve, which consumed approximately 440 AF of water per year (ADWR 1991). The equivalent mitigation credit for this action is 220 acres (440 AF/2AF) (Table 4). SRP may likewise retire irrigation lands as part of the additional conservation measures.

The additional conservation measures of habitat protection, acquisition and management of buffers, cessation/reduction of diversions or ground water pumping, and associated management would be provided in perpetuity. Permanent funding would be provided for management and monitoring.

*Schedule for Conservation Measures.* Prior to the effective date of the permit, at least 750 acres of mitigation would be in place in the form of habitat acquisition of fee title or easements and management of occupied or potentially occupied flycatcher habitat, or other actions needed to remove threats to or benefit riparian habitat. Within 1.5 years of permit issuance if granted, another 750 acres of mitigation would be implemented. All land acquisitions and management or additional conservation measures would be in place within 3 years of permit issuance unless otherwise agreed by FWS. A summary of the expected timing and location of habitat acquisition and additional conservation measures is shown in Table 4.

*Adaptive Management.* Adaptive management would be implemented if monitoring shows that acres of occupied flycatcher habitat lost exceeds 750 acres in a single refill event or drawdown period. SRP would develop and implement additional mitigation within 3 years, to address impacts for up to an additional 500 acres of lost occupied habitat, for up to a total of 1,250 acres of impacts. Additional mitigation would be comprised of habitat acquisition and management (two-thirds of the additional mitigation or up to 1,000 acres) and additional conservation measures (one-third of the additional mitigation or up to 500 acres). If more than 1,250 acres are impacted in a single refill or drawdown, a permit amendment would be necessary.

**Table 4. Roosevelt mitigation schedule (all values in estimated acres).**

| Location                             | Phase 1<br>(Pre-Permit)                  |  | Phase 2<br>(Within 1.5 Years of Permit)  |  | Phase 3<br>(Within 3 Years of Permit)    |  |
|--------------------------------------|--|--|--|--|--|--|
|                                      | Habitat<br>Acquisition and<br>Management | Additional<br>Conservation<br>Measures | Habitat<br>Acquisition and<br>Management | Additional<br>Conservation<br>Measures | Habitat<br>Acquisition and<br>Management | Additional<br>Conservation<br>Measures |
| <b>Roosevelt</b>                     |  |  |  |  |  |  |
| Rockhouse                            | —  | —                                      | 20                                       | —                                      | —  | —                                      |
| Enforcement/Management               | —  | —                                      | —  | 300†                                   | —  | —                                      |
| <b>Verde</b>                         |  |  |  |  |  |  |
| Camp Verde                           | 90                                       | 30                                     | —  | —                                      | —  | —                                      |
| Other Sites                          | —  | —                                      | 30                                       | 10                                     | —  | —                                      |
| <b>San Pedro and Safford Valleys</b> |  |  |  |  |  |  |
| Reclamation Preserve                 | 403                                      | 220                                    | —  | —                                      | —  | —                                      |
| Reclamation Additional               |  |  |  |  | 200‡                                     |  |
| SRP                                  | 75                                       | 140                                    | 492                                      | 30                                     | 190                                      | 20                                     |
| <b>Gila or Other*</b>                | remainder                                | remainder                              | remainder                                | remainder                              | remainder                                | remainder                              |
| Totals                               | 568                                      | 390                                    | 542                                      | 340                                    | 390                                      | 20                                     |
| Total for Phase (2,250 acres)        | 958                                      |  | 882                                      |  | 410                                      |  |

Note: Estimated acres for a particular location and phase will only be implemented if feasible. If not feasible, other locations will be selected.

†Estimated at a present value of \$1.3 M for the present value of enforcement time and expenses divided by \$4,500/acre (average habitat acquisition and long-term management costs for San Pedro mitigation sites). The present value of \$1.3 M represents a non-wasting capital account generating \$78,000/year at 6 percent interest

‡SRP would be responsible for any remaining balance.

\*“Remainder” means any acreage that SRP is unable to establish or acquire in the Rockhouse, Verde, or San Pedro and Safford valleys, or if management at Roosevelt is determined to be ineffective, will be acquired at other locations along the Gila or other rivers.

**RHCP Conservation Measures for Yuma Clapper Rails.** Habitat mitigation for Yuma clapper rails would be incorporated into the mitigation measures for flycatchers. Specifically, 5 acres of the Rockhouse riparian vegetation establishment project on the Salt arm of Roosevelt will be dedicated to creation of cattail marshes (Table 5). In addition to providing on-site mitigation for Yuma clapper rails, these marshes will benefit the flycatcher mitigation efforts at this location by providing surface water and moist soil beneath the willow and cottonwood overstory, helping to replicate conditions preferred by flycatchers. Conversely, Yuma clapper rails prefer marsh habitat that is bordered by dense woody vegetation, which would be established at the Rockhouse site for the benefit of flycatchers and cuckoos.

*Adaptive Management.* If circumstances at Roosevelt change in the future, and more than 5 acres of occupied Yuma clapper rail habitat is lost from inundation or drawdown, SRP would establish or protect up to 5 acres of additional marsh habitat near Roosevelt on a 1:1 basis for lost occupied habitat. If feasible, this additional habitat would be created by expansion of the Rockhouse project. If not feasible at Rockhouse, private land along Tonto Creek or locations along the lower Salt or Gila rivers suitable for marsh protection and establishment would be acquired and placed under permanent management.

**RHCP Conservation Measures for Bald Eagles.** In order to minimize and mitigate the potential impact on bald eagle habitat and any resulting incidental take of bald eagles, SRP will implement the following measures in addition to those mitigation measures Reclamation is responsible for under previous ESA compliance:

*Habitat Protection, Establishment, and Rehabilitation.*

- A pilot project to establish riparian vegetation, including cottonwoods, would be implemented at the Rockhouse site on the Salt arm of Roosevelt.
- After construction by Reclamation, SRP would maintain the Pinto nesting platform for the duration of HCP.
- Within 3 years of permit issuance, SRP would acquire mitigation habitat for flycatchers, much of which is comprised of cottonwoods and willows that may provide suitable habitat for bald eagles in some locations.
- SRP would use its best efforts to assist in restoring habitat on the Fort McDowell Reservation. SRP's potential role would be to provide funding for construction and maintenance of fencing to prevent livestock and recreation access to riparian habitat and to promote the re-establishment of riparian vegetation. Funding also may include planting of cottonwoods and willows, signs, educational materials, beaver protection, or other efforts needed to protect and maintain the riparian habitat.

*Bald Eagle Management.* SRP will continue to assist with management activities to help manage and improve bald eagle populations in the Roosevelt area as part of the Southwest Bald Eagle Management Committee. The efforts described below would be assessed annually to ensure that the programs are productive.



- SRP will develop a coordinated management and implementation plan with AGFD and the Service to rescue any eagles, eagle eggs, or nestlings at Roosevelt Lake. The plan would be complete within a year of permit issuance and implementation would begin within 2 years of permit issuance.
- Annual funding of a pair of seasonal bald eagle nestwatchers and proportional program coordination through an existing Arizona Bald Eagle Nestwatch Program, and daily monitors throughout the breeding season protect individual nest sites, nesting eagles, and educate the public.
- Each year, SRP would assist with three monthly Occupancy and Reproduction Assessments and nest search helicopter events and provide funding for coordination and attendance by existing bald eagle management personnel.
- SRP would provide a maximum of three annual helicopter flights and proportional funding for rescue or other management efforts. SRP would continue these measures for the life of the permit provided there is an Arizona bald eagle program in which SRP is able to participate. SRP shall not be required to create a bald eagle program if the current program is dismantled.

*Adaptive Management.* Adaptive management is not provided for bald eagles because the conservation measures described above address the changed circumstances as a result of reservoir operations. Previously described habitat protection and management measures are believed to be adequate for mitigating potential impacts to bald eagles from the continued operation of Roosevelt. No adaptive management measures would be implemented. If take is anticipated to be exceeded, a permit amendment would be required.

**RHCP Mitigation Measures for Cuckoos.** SRP would implement a number of conservation measures as part of the RHCP in order to minimize and mitigate the anticipated maximum impact on occupied cuckoo habitat (313 acres as discussed in Chapter 4) from continued full operation of Roosevelt. These measures, along with the schedule for implementation, and proposed adaptive management measures are described below.

*Habitat Acquisition and Management.* Separate habitat mitigation for the cuckoo is not anticipated, because onsite and offsite mitigation for flycatchers and bald eagles also would benefit cuckoos. Cuckoos would benefit from the habitat protection measures initiated by Reclamation as mitigation for the construction of Modified Roosevelt and additional habitat protection measures implemented by SRP for flycatchers. Habitat requirements for cuckoos, eagles, and flycatchers overlap to a large degree. Cuckoos and flycatchers are the most similar in their habitat use. Both require blocks of dense, tall riparian vegetation for foraging and nesting, including willows and cottonwoods, and habitat must be relatively close to open water. Flycatchers tend to use nest sites that are closer to water than cuckoos. Cuckoos appear to generally require larger blocks of suitable habitat and do not nest as closely together as flycatchers. Cuckoos need at least 10-acre blocks of habitat for nesting and foraging, and generally do not use narrow strips of habitat. Cuckoo and eagle habitat requirements also overlap somewhat. Eagles use mature cottonwood trees for nesting and perching. Cuckoos also may use cottonwoods

for nesting and foraging. Cuckoos also may benefit from closure of eagle nesting areas to recreational use during the breeding season implemented under the Reclamation BOs for construction of Modified Roosevelt Dam.

Because the mitigation measures for flycatchers and eagles are intended to support cuckoos as well, the following considerations were included in the selection of mitigation sites in the RHCP:

- Cuckoos benefit from the creation or protection of riparian areas composed of dense cottonwood/willow woodlands.
- Some of the cottonwood/willow woodlands should be at least 10 acres in size.
- Cottonwood/willow woodlands should be provided in blocks rather than in strips to the maximum extent possible.
- To the degree feasible, riparian habitat should be located in areas that favor a natural succession of vegetation so that there will be periodic establishment of riparian vegetation patches.

Because comprehensive cuckoo surveys have not been completed yet at Roosevelt, the impact analysis in the RHCP is based on potentially suitable cuckoo habitat currently present at Roosevelt Lake, i.e., 313 acres. As with flycatchers, mitigation measures for the 313 acres would be 2:1 in habitat acquisition and management and 1:1 in additional conservation measures (Table 5). The additional conservation measures for cuckoos would be satisfied by the same measures implemented for flycatchers. The 2:1 mitigation requirement for riparian habitat (626 acres) would be determined by measuring the patches of cottonwood/willow, mixed riparian vegetation, or other suitable habitat on the mitigation properties purchased as part of the flycatcher program. If additional land is required to meet the 626-acre minimum, SRP would acquire that property and manage it in perpetuity. In the long term, an accounting of habitat actually occupied at Roosevelt and suitable and occupied habitat on mitigation properties would be conducted as part of the implementation of the RHCP.

*Adaptive Management.* Over time, as vegetation communities change at Roosevelt Lake, the acreage of cuckoo habitat affected is likely to change as well. Also, there is substantial uncertainty over the amount of currently occupied and suitable habitat at Roosevelt. Thus, adaptive management would be implemented if the acreage of occupied cuckoo habitat to be lost at Roosevelt from inundation or drying exceeds the 313 acres mitigated initially. SRP would implement additional mitigation within 3 years for up to an additional 800 acres of lost occupied cuckoo habitat. The additional impact of up to 800 acres would be mitigated by acquiring and managing in perpetuity additional acres of riparian habitat at a 2:1 ratio (up to 1,600 acres of additional habitat) and implementing additional conservation measures at a 1:1 ratio (up to the equivalent of 800 acres of riparian habitat). In summary, all flycatcher mitigation measures would be credited toward cuckoo mitigation to the extent applicable. If more than 1,113 (313 + 800) acres of occupied cuckoo habitat are lost, a permit amendment would be required.

**Overview of Minimization and Mitigation Measures and Sites.** Table 5 provides a summary of proposed minimization and mitigation measures for flycatchers, Yuma

clapper rails, cuckoos, and bald eagles. Because of overlapping habitat characteristics for flycatchers, Yuma clapper rails, and cuckoos, the proposed acquisition and management of flycatcher habitat is anticipated to partially or fully satisfy the mitigation habitat requirements for Yuma clapper rails and cuckoos.

**Table 5. Overview of minimization and mitigation measures.**

| Species           | Minimization and Mitigation Measures                                      | Acres                        |
|-------------------|---|------------------------------|
| Flycatcher        | Acquisition and management of riparian habitat                            | 1,500                        |
|                   | Additional conservation measures  | <u>+750</u>                  |
|                   | Subtotal  | 2,250                        |
|                   | Reclamation mitigation measures (estimated)                               | <u>-820*</u>                 |
|                   | Net to be acquired by SRP (estimated)                                     | 1,430                        |
|                   | Adaptive management (up to 500 acres of additional impact)                |                              |
|                   | • Acquisition and management of riparian habitat                          | up to 1,000                  |
|                   | • Additional conservation measures  | <u>up to 500</u>             |
|                   | Subtotal  | up to 1,500                  |
|                   | Total with adaptive management (2,250 + up to 1,500)                      | up to 3,750                  |
| Yuma Clapper Rail | Acquisition and management of riparian habitat                            | 5 <sup>†</sup>               |
|                   | Adaptive management (up to 5 acres of additional impact)                  | <u>up to 5<sup>†</sup></u>   |
|                   | Total with adaptive management  | up to 10 <sup>†</sup>        |
| Cuckoo            | Acquisition and management of riparian habitat                            | 626 <sup>†</sup>             |
|                   | Additional conservation measures  | <u>+313<sup>†</sup></u>      |
|                   | Subtotal  | 939 <sup>†</sup>             |
|                   | Reclamation mitigation measures (estimated)                               | <u>-550<sup>†</sup></u>      |
|                   | Net to be acquired by SRP (estimated)                                     | 389 <sup>†</sup>             |
|                   | Adaptive management (up to 800 acres of additional impact)                |                              |
|                   | • Acquisition and management of riparian habitat                          | up to 1,600 <sup>†</sup>     |
|                   | • Additional conservation measures  | <u>up to 800<sup>†</sup></u> |
|                   | Subtotal  | up to 2,400                  |
|                   | Total with adaptive management (939 + up to 2,400)                        | up to 3,339 <sup>†</sup>     |
| Bald Eagle        | Pilot project to establish cottonwoods near Roosevelt                     | —                            |
|                   | Maintenance of Pinto nest platform  | —                            |
|                   | Some habitat acquired for flycatchers may benefit eagles                  | —                            |
|                   | Development and implementation of bald eagle management plan at Roosevelt | —                            |
|                   | Continuation of support of interagency monitoring program                 | —                            |
|                   | Assist FMIC with riparian habitat restoration                             | —                            |

\*The 820 acres comprises acquisition and management of an estimated 600 acres of riparian habitat and 220 acres of additional conservation measures.

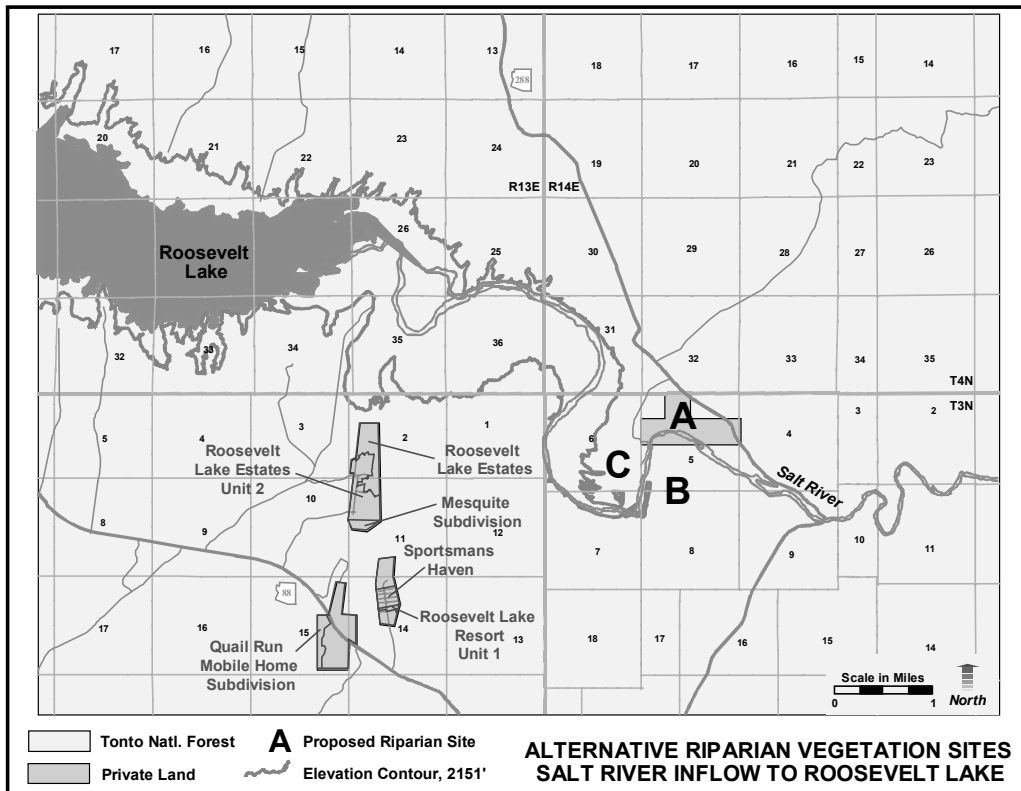
<sup>†</sup>Due to habitat similarities, these acreages are expected to be partially or entirely encompassed within the minimization and mitigation measures for flycatchers; however, additional riparian habitat would be acquired if necessary.

**Establishment of Riparian Habitat on the Salt Arm of Roosevelt.** There is currently no known existing riparian habitat used by flycatchers along Tonto Creek or the Salt River above the maximum storage level in the reservoir, and opportunities to establish or restore riparian habitat are limited. However, SRP would develop a 20-acre pilot project to establish and maintain riparian vegetation suitable for the listed and candidate species encompassed by the RHCP at one or more sites on the Salt arm of Roosevelt just above the point of inflow of the Salt River. If the pilot project is successful, additional riparian vegetation would be established and maintained in this area if feasible. If the pilot project is not successful, SRP would protect, enhance and maintain riparian habitat at alternative locations.

The establishment of riparian vegetation on the Salt arm of Roosevelt would complement and add to habitat that would be available in most years at Roosevelt for flycatchers, Yuma clapper rails, cuckoos, and bald eagles. In years when Roosevelt is full, Salt arm riparian vegetation would provide habitat for these species in the Roosevelt area. The 20-acre site is large enough to establish nesting and foraging perches for one bald eagle breeding area, breeding habitat for 10 to 20 flycatcher territories and one or two cuckoo territories, and marsh habitat for several Yuma clapper rail territories.

Three sites for potential establishment of riparian vegetation on the Salt arm of Roosevelt were evaluated (Figure 9). All three sites are located at or above elevation 2,151 feet along the Salt River near the inflow to Roosevelt. Only the Rockhouse Farm site ("Rockhouse") (Site A) and Power Canal site (Site B) have conditions suitable for establishment of riparian habitat. Site C, the Meddler Point site was eliminated from further consideration because of poor soils and difficulty in delivering water to the site. From the preliminary investigations, the Rockhouse site has been selected as the preferred location for the pilot project based on the combination of soils, topography best suited for the establishment of willows and cottonwoods and feasibility of water delivery. This site is located on former agricultural fields owned in fee by Reclamation. This site can receive water from the Salt River via the existing Rockhouse ditch that diverts water from an existing diversion dam across the Salt River. In addition, the Rockhouse site has limited access, which protects the area from recreational use or other disturbances. The site also is located more than 20 feet above the Salt River, which reduces the potential for damage from scouring floods.

**Figure 9. Minimization and Mitigation Sites on the Salt Arm of Roosevelt.**



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A 20-acre pilot project was selected because existing water rights for this land are available and this is approximately the minimum patch size needed by cuckoos. The planning and permitting process for implementation of the pilot project was initiated in December 2001. The pilot project is scheduled for operation by the end of January 2004, pending compliance with NEPA and applicable environmental regulations.

The general engineering approach to provide water to the pilot project would be to rehabilitate the existing diversion and conveyance facilities, including lining the ditch with concrete from the diversion dam to the edge of the pilot project. The dimensions of the ditch will be: 1) depth of 3.5 feet; 2) bottom width of 2 feet; 3) sideslopes of 1:1; and 4) top width of 10 feet. A concrete box would be constructed at the head of the ditch to serve as a desilting basin and to return flow to the river as necessary. The box would be about 8 feet wide, 30 feet long, and 9 feet deep, and would be covered with a lockable grate for safety. Return of water to the river would be through a drop structure (to function as a fish barrier) and a buried 30-inch corrugated metal pipe. After leaving the box, water in the ditch would have a maximum depth of 3 feet.

A 0.6-mile gravel road would be constructed along the ditch in order to provide construction access, to maintain the ditch (e.g., remove sediment), and to access the pilot

project. The width of the maintenance road would be 10 feet. An additional 10 feet beside the maintenance road would be used for disposal of sediment removed from the ditch. Including the ditch, the total right-of-way requirement would be 35 feet. The road and ditch would be fenced with barbed wire with signs placed at frequent intervals warning of potential danger from the ditch. Two locked gates would be installed on the road, one at the entrance near the existing diversion dam and one at the boundary of the Reclamation fee land. Signs explaining the purpose of the project and the reason for closure would be placed at each gate. Following construction, use of the road for operation and maintenance of the project is expected to average two round trips per day.

Additional public safety measures such as pipe barriers to prevent vehicle access and higher-security fencing would be implemented by SRP if necessary. Safety is an especially high priority along the ditch because of heavy recreation use in the area.

A broad, shallow, unlined main distribution ditch would be constructed as part of the water delivery facilities from the end of the concrete delivery ditch into the mitigation site. This broad ditch would recharge the water table and also would serve as a moat around the project area, which may discourage intrusion from people and animals, including cats, dogs, and herbivores. The pilot project area would be fenced and signed to minimize access and disturbance. Turnouts from the main distribution ditch would be used to flood the planted riparian and marsh vegetation.

The goal for vegetation establishment at the Rockhouse pilot project would be to establish a stand of dense riparian vegetation composed mainly of Goodding willows and Fremont cottonwoods along with cattail marshes. The project would be implemented over two growing seasons with the seeding and planting of about 10 acres in the spring of 2004. The seeding and planting of remaining acres would be conducted in the spring of 2005.

Prior to construction, existing vegetation on the Rockhouse site would be cleared and grubbed and the site graded to accommodate the flood irrigation system. Mesquite suitable for possible use by cuckoos would be preserved to the extent possible. A 5-acre area within the site would be excavated as shallow ponds suitable for establishment of cattail marsh. Site preparation would be conducted to leave the soil surface in a roughened condition so that vegetation can benefit from protected depressions and increased moisture retention.

A windbreak would be established surrounding the site to protect seedlings. Cottonwood and willows would be placed around the north, south, and western edges of the site using container stock or poles ranging from ½ to 2 inches in diameter and from 2 to 5 feet in length. The trees would be placed in two rows at approximately 10-foot intervals. Inside of the windbreak, mostly willows and some cottonwoods would be planted in the late winter (late February or early March). Cottonwood and willow cuttings and/or tubelings would be planted on approximate 8-foot centers, at a density of about 680 plants per acre. Cuttings/tubelings would be less than 1-inch diameter, and about 2 to 3 feet long and would be harvested from branches of live trees at Roosevelt below an elevation of 2,136 feet in areas not previously used by flycatchers. In addition, about 5 acres of cattail marsh would be established using root stock and seeding.

It is anticipated that salt cedar may colonize the Rockhouse site. Colonization by this species is probably inevitable but control measures for salt cedar are not proposed because flycatchers use riparian thickets with salt cedar, and salt cedar would contribute to the vegetation density preferred for flycatcher nesting. Planting cuttings/tubelings of cottonwood and willow would provide these species with a competitive advantage over salt cedar to form the overstory vegetation at the Rockhouse site. If flycatchers and cowbirds are present, cowbirds would be trapped at the Rockhouse site unless FWS agrees that it is not appropriate.

The pilot project would be determined successful if woody riparian vegetation within the project area becomes established within five years with the potential to meet the criteria for a desirable habitat as the vegetation grows. As the trees age, they also could provide roosting and nesting habitat for bald eagles. If the pilot project is successful, the project may be expanded up to a maximum of 75 acres if additional mitigation is required in the future under adaptive management. If additional land is developed as habitat along the Salt arm of Roosevelt, SRP would ensure that sufficient water rights are available to irrigate the lands and would dedicate those water rights to the project.

If the objective of establishing and maintaining riparian vegetation that could serve as potential breeding and nesting habitat for flycatchers cannot be achieved on the Salt arm of Roosevelt, SRP would protect, enhance and maintain riparian habitat at other location(s). The specific alternative location(s) would be selected in consultation with FWS. The first priority for alternative sites would be to augment mitigation lands along the Verde, San Pedro, Gila, or other rivers where SRP also would be protecting and enhancing habitat as part of the RHCP (see below). The quantity of additional habitat that would be protected or enhanced at the alternative location(s) would be up to a maximum of 75 acres, i.e., the goal for the Salt arm of Roosevelt.

**Riparian Habitat Protection and Management at Roosevelt.** Recent observations indicate that there would be a major benefit from additional management and protection efforts for riparian habitat in the vicinity of Roosevelt (Woods, pers. comm. 2001). Within 1.5 years of ITP issuance, SRP would negotiate a memorandum of understanding with the Tonto National Forest to provide funding for a Forest Protection Officer (FPO). The FPO would be responsible for habitat protection, enhancement, and management activities at Roosevelt in support of the RHCP. The FPO funded by SRP would be a full-time employee with a vehicle and appropriate equipment to patrol Roosevelt. The FPO would have the authority to issue citations. In terms of habitat protection, efforts would focus on patrolling flycatcher, Yuma clapper rail, cuckoo, and bald eagle habitat at and near Roosevelt to ensure that recreation activities do not adversely impact habitat, or disturb the listed species during breeding and nesting. In addition, the habitat would be patrolled in order to protect riparian vegetation from cattle trespass, fire, or other damage. Other responsibilities would include: 1) fence maintenance including livestock exclusion fencing established by Reclamation and the Tonto National Forest as part of the Tonto Creek Riparian Unit during mitigation for the impacts of construction of Modified Roosevelt as well as removal of trespass livestock from the Unit or Roosevelt habitat; 2) maintenance of signage relative to seasonal closure areas; and 3) public education regarding endangered species management at Roosevelt. If determined by SRP, FWS

and the Forest Service to be potentially beneficial, the FPO may also be available to plant or encourage riparian vegetation along the Salt River and Tonto Creek inflows to Roosevelt near elevation 2,151 feet in order to promote the existence of habitat when the lake fills to capacity.

If FWS determines that the habitat protection and management program is not effective, it may request SRP to devote remaining funds to habitat acquisition or other conservation measures.

**Protection and Management of Riparian Habitat in the Verde Valley.** The Verde River flows for approximately 140 miles from its headwaters at Sullivan Lake Dam near Paulden in Yavapai County eastward to Perkinsville, and then southeast to its confluence with Fossil Creek, where it continues south to the confluence with the Salt River. Riparian vegetation in the Verde Valley is characterized by patches of cottonwood (*Populus* sp.), willow (*Salix* sp.), and mixed broadleaf riparian vegetation on a broad alluvial floodplain of sand, gravel, and cobble, with a relatively low stream gradient. Riparian vegetation varies in width from approximately 500 to 1,600 feet. The perennial sections of the Verde River have been recognized as biologically significant by several groups and government entities (Fichtel and Marshall 1999; Carothers et al. 1974; Tomoff and Ohmart 1994; EPA 1995). However, habitat fragmentation, water diversion, trampling due to recreational and livestock use of the river, and development pressures threaten the biological integrity of the river (Fichtel and Marshall 1999).

In 1997, FWS designated critical habitat for the flycatcher along approximately 90 miles of the Verde River above Horseshoe Reservoir (FWS 1997a; 1997b), although the designation for critical habitat has currently been set aside (FWS 2001a). Currently, the only known areas occupied during breeding season by flycatchers are at Camp Verde in the Verde Valley (Paradzick et al. 2000) and 2002 observations at the Horseshoe Reservoir inlet, although there is anecdotal evidence of nesting on private property that has not been surveyed (Fichtel and Marshall 1999).

SRP would acquire and manage up to 120 acres of riparian habitat in the Verde Valley as part of the mitigation measures in the RHCP (see Figure 8, Location 2).<sup>23</sup> The portion of the Verde Valley near the town of Camp Verde was selected as the focus of conservation in this area because the existing flycatcher population in the area is located along this reach of the Verde River. However, if habitat conservation in this area were determined to be infeasible, riparian habitat in another portion of the Verde Valley would be evaluated for acquisition and management. If insufficient habitat is found in the Verde Valley, the balance of the acreage would be obtained along the San Pedro or elsewhere in central Arizona as described in later sections.

The exact quantity and timing of conservation at this location would depend on the feasibility of acquiring or otherwise permanently protecting desirable lands in this area. Preliminary investigations indicate that there are a number of constraints to habitat

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<sup>23</sup> Depending on the success of establishing riparian vegetation on the Salt arm of Roosevelt, up to 75 acres of additional riparian habitat may be protected along the Verde or elsewhere.



conservation in this area including uncertainties with land title, small parcel size, reluctant sellers, and potential encroachment by urban development.

To the extent that habitat can be acquired in this area, SRP also would fund maintenance for that habitat in perpetuity. Maintenance funding would include initial construction or improvement, and long-term maintenance of fencing to prevent access by people and livestock. Maintenance funding also may include planting of riparian vegetation, provision of security patrols, and other efforts needed to protect and maintain the habitat as specified in the management plan for each parcel. If flycatchers and cowbirds are present, cowbird trapping would be used on managed lands to reduce impacts to flycatcher breeding success unless the FWS agrees that it is not appropriate.

If SRP's efforts to conserve up to 120 acres of desirable riparian habitat in the Verde Valley are unsuccessful, SRP would pursue equivalent mitigation measures elsewhere. SRP would acquire habitat at other location(s) that would be selected in consultation with FWS. The first priority for alternative sites would be to augment mitigation lands along the San Pedro or other rivers where SRP is conserving habitat as part of the RHCP (see below). The quantity of habitat acquired at alternative sites will be up to 120 acres, i.e., the goal for the Verde Valley.

**Protection of Riparian Habitat on the Fort McDowell Reservation.** SRP and the Fort McDowell Indian Community (FMIC) are pursuing a possible joint venture to conserve habitat along the Verde River on the Fort McDowell Reservation (Figure 8, Location 3). About 10 miles of the lower Verde River flows through the Fort McDowell Reservation just above the confluence with the Salt River.<sup>24</sup> The floodplain along this reach of the Verde River is about 1 mile wide. This reach of the Verde River was selected for protection efforts because it is relatively close to Roosevelt, it has a broad floodplain with a relatively low gradient and it has cottonwood trees that provide nesting for bald eagles.

FMIC is interested in protecting or enhancing riparian habitat on the Reservation as part of maintaining its cultural and environmental heritage (Ethelbah, pers. comm. 2001). If a joint venture is established, protection or enhancement of habitat likely would be combined with protection of adjacent areas that could be used by Community members for compatible recreation and environmental education (Id.).

SRP would assist FMIC with restoration of riparian habitat on the floodplain of the Verde River that would be suitable for use by bald eagles. The exact quantity of habitat that may be protected will depend on the desires of FMIC, and SRP would use its best efforts to conserve habitat on the Reservation in cooperation with FMIC.

SRP's role in protecting or enhancing habitat on the Fort McDowell Reservation would be to provide funding for riparian restoration planning, construction and maintenance of fencing to prevent livestock and recreation access, and to promote the re-establishment of riparian vegetation. Maintenance funding also may include planting of riparian vegetation, signs, educational material, beaver protection, and other efforts

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<sup>24</sup> Information for this section is derived from SRP files; FWS 1980; and Duncan and Reichenbacher 1991.

needed to protect and manage the habitat. If these efforts are not practicable, no further efforts would be made by SRP at Fort McDowell.

**Acquisition and Management of Riparian Habitat Along the Lower San Pedro Valley.** SRP would conserve riparian habitat in the lower San Pedro Valley as part of the mitigation measures in the RHCP (see Figure 8, Location 4).<sup>25</sup> In this area, habitat conservation will focus on acquiring and managing desirable riparian habitat by acquiring fee title or easements. In addition, conservation efforts would seek to provide additional water to riparian habitat through retirement of irrigated fields or other water management measures. This portion of the San Pedro Valley was selected as a major focus of acquisition and management efforts because: 1) previous mitigation efforts, including those associated with the construction of Modified Roosevelt, have already protected some habitat along the lower San Pedro; 2) flycatcher populations already occupy the lower portion of the valley; 3) the San Pedro River has relatively natural stream processes that will maintain riparian habitat in the future, in part because it is an unregulated stream; and 4) there has been some observed movement of flycatchers between Roosevelt and the San Pedro Valley.

The lower San Pedro River has regional significance because of the high biological diversity it supports. Large, contiguous cottonwood/willow stands provide habitat for flycatchers, bald eagles, and cuckoos, as well as other federally protected species and species of concern (TNC 1999a). The Winkelman to Mammoth reach of the San Pedro was designated as critical habitat for the flycatcher (TNC 1999a), although the designation was subsequently set-aside by court order in 2001 (FWS 2001a). Adding to existing lands already protected in the corridor offers an opportunity to protect large blocks of habitat and prevent fragmentation due to further development. The region is experiencing stress due to loss and degradation of riparian habitat from existing land uses and increasing residential development. Land use impacts to water quality and dewatering are also threats (Fichtel and Marshall 1999; Stromberg 2001b).

TNC owns outright or owns conservation easements on several parcels in the San Pedro River floodplain near Dudleyville (5 miles south of Winkelman). The largest of these, the San Pedro River Preserve, is 865 acres in size. State and Federal ownership in the San Pedro River corridor includes the Bureau of Land Management (BLM), Reclamation, and the Arizona State Land Department. Additionally, several parcels are public domain allotments and are controlled by Native Americans. Large segments of the floodplain are owned by mining companies such as ASARCO (TNC 1999a). Portions of the floodplain and adjoining areas have been converted to residential development and associated land uses. Other areas are actively irrigated in farming operations (TNC 1999a).

The lower San Pedro River provides suitable flycatcher habitat with flycatcher nesting documented at several locations. In 2000 and 2001, the lower San Pedro River and nearby Gila River supported approximately 35 percent of the known breeding pairs

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<sup>25</sup> For purposes of the EIS, the lower San Pedro River is defined as the approximately 20-mile reach of the San Pedro from the vicinity of Mammoth to the mouth of the river at Winkelman.

in Arizona, one of the largest concentrations throughout the bird's range (Paradzick et al. 2001, p. 20; Smith et al. 2002, p. 9). The riparian habitat suitable for flycatchers also provides habitat for cuckoos. Cuckoos are known to occur on the lower San Pedro near Dudleyville (Harris, pers. comm. 2001).

If feasible, SRP will conserve up to 760 acres of riparian habitat along the San Pedro River in the area shown on Figure 8, Location 4. Preliminary investigations indicate that there are a number of constraints to acquisition of habitat in this area including varying sizes of blocks of land and uncertain water supplies. However, SRP would use its best efforts to establish habitat preserves in the lower San Pedro Valley.

To the extent that habitat can be acquired in this area, SRP would provide maintenance measures for that habitat in perpetuity. Maintenance funding would include initial construction or improvement, and long-term maintenance of fencing to prevent access by people and livestock. Maintenance funding also may include planting of riparian vegetation, provision of security patrols, and other efforts needed to protect and maintain the habitat as specified in the management plan for each property. Management plans for lands along the lower San Pedro will be compatible with those developed by The Nature Conservancy (TNC 1999b). If flycatchers and cowbirds are present, cowbirds would be trapped at mitigation sites unless FWS agrees it is not appropriate.

If SRP's efforts to protect or enhance up to 760 acres of habitat in the in the lower San Pedro Valley are unsuccessful, SRP would pursue equivalent mitigation measures elsewhere. SRP would conserve habitat at other location(s) that would be selected in consultation with FWS. The first priority for alternative sites will be to augment mitigation lands along other rivers where SRP is conserving habitat as part of the RHCP (see below). The quantity of habitat that would be acquired and managed at these alternative locations would be the balance of the goal in the in the lower San Pedro Valley.

#### **Acquisition and Management of Riparian Habitat Elsewhere in Central Arizona.**

If necessary, SRP would conserve riparian habitat along other river reaches in central and southern Arizona as part of the mitigation measures in the RHCP. Like the Verde and San Pedro areas, riparian habitat conservation would focus on acquiring and managing habitat in perpetuity. As in the San Pedro, opportunities would be sought to provide additional water to riparian habitat through retirement of irrigated fields or other water management measures. The focus of conservation efforts along other stream systems will be in areas where flycatcher populations currently exist or in areas that are in proximity to existing populations. Primary lands for additional acquisition and management efforts are located in Safford Valley along the Gila River between San Carlos Lake and Safford, Arizona (Figure 8, Area 5). Other candidate areas include the Gila River upstream from Safford, Arizona to Cliff, New Mexico; the middle San Pedro River Valley near Redington; the Salt River, Tonto Creek, and their tributaries above Roosevelt; the Hassayampa River near Wickenburg, Arizona; the lower Salt and Gila rivers near and downstream of their confluence, and the Santa Cruz River between Tucson and Nogales, Arizona.

These river reaches have been identified as important habitats in central Arizona for a variety of species including flycatchers and cuckoos as well as numerous other species that are federally protected or are species of concern (Fichtel and Marshall 1999). Relatively large populations of flycatchers occupy areas along the upper Gila River (Paradzick et al. 2001; Fichtel and Marshall 1999; Smith et al. 2002). A few (1 to 3) territories have been documented along the Hassayampa River in past years (Paradzick et al. 2001). Although the Santa Cruz, lower Salt, and lower Gila reaches do not have documented populations of flycatchers at present, they are within the flycatcher's historical range and have been identified to have habitat that is a priority for acquisition (Fichtel and Marshall 1999). Cuckoos have been detected along the Gila, Hassayampa, and Santa Cruz rivers.

To the extent that sufficient acreage to fulfill the RHCP mitigation requirement cannot be obtained along the Verde and San Pedro rivers, SRP would acquire and manage the balance of those acres of riparian habitat elsewhere in central Arizona. SRP also would fund maintenance measures for that habitat. Maintenance funding would include initial construction or improvement, and long-term maintenance of fencing to prevent access by people and livestock. Maintenance funding also may include planting of riparian vegetation, provision of security patrols, and other efforts needed to protect and maintain the habitat as specified in the management plan for each property. If flycatchers and cowbirds are present, cowbirds would be trapped at the mitigation sites unless FWS agrees that it is not appropriate.

**SRP Management and Coordination.** SRP would establish a full-time staff position in its Environmental Services Department to manage and coordinate implementation of the RHCP. The person filling this position would be required to have previous experience with management of biological resource issues. The primary responsibility for this staff position would be to ensure that the RHCP is fully implemented including all adaptive management, monitoring and reporting measures. The following tasks would be included in the job description:

- Manage vegetation monitoring and population surveys for flycatchers, Yuma clapper rails, and cuckoos at Roosevelt and on mitigation properties as specified in the RHCP.
- Manage the pilot project to establish and manage habitat near the Salt inlet to Roosevelt and expand if feasible, including acquisition of water rights if necessary.
- Coordinate with Tonto National Forest personnel on enforcement and management efforts for listed species at Roosevelt.
- Implement management measures as necessary, including adaptive management involving: 1) purchasing or protection of additional lands; 2) managing the start-up activities on mitigation properties (e.g., managing environmental clean-up if needed, contracting for fence construction, and developing and initiate on-going management plans); and 3) providing for ongoing maintenance of all mitigation sites.
- Coordinate implementation of conservation measures for bald eagles.

- Prepare annual reports to be submitted to FWS.
- Prepare budget recommendations and perform other administrative tasks related to the implementation of the RHCP including tracking schedules of acquisition, monitoring, and management activities.

#### **3.4.2.4 Funding Assurances**

SRP fully commits to meeting all of its obligations in the RHCP. SRP's funding assurances are specified below and in the Implementing Agreement.

During the initial years of the permit, SRP would include funds in its annual budget to implement the RHCP. Funding requirements in these early years would include land acquisition costs as well as annual operating, management, and monitoring expenses. No later than five years after the permit is issued, SRP would ensure that permanent funding is available to meet its continuing obligations under the RHCP. Unless other methods of assuring permanent funding are selected by SRP,<sup>26</sup> principal would be placed in non-wasting accounts designated solely for that purpose. The accounts would be in the form of segregated fund(s) at SRP or separate trust account(s).<sup>27</sup> Principal in the accounts would be of an amount to generate annual cash flow sufficient to satisfy SRP's continuing obligations under the RHCP, as agreed to by FWS and SRP.<sup>28</sup> From time to time, SRP may reallocate a proportional amount of the principal from the accounts to a qualified organization that assumes permanent management responsibility for a mitigation property. If additional mitigation lands or other conservation measures are implemented under the adaptive management provisions, SRP would supplement the principal in the accounts to ensure that permanent funding is available to meet those

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<sup>26</sup> If SRP finds it to be cost-effective, it may substitute an irrevocable letter of credit, surety bond, insurance, or other suitable assurance of permanent funding so long as the method of funding assurance is acceptable to FWS.

<sup>27</sup> For segregated fund(s) at SRP or trust account(s), SRP would utilize prudent management of the financial assets of the accounts to generate the income to pay for annual expenses. Investment criteria for the accounts would include:

- 1) Performance and portfolio data submitted by investment manager candidates must be audited by an independent CPA firm or must be otherwise verifiable, and must include at least five years of performance history.
- 2) Performance must track or exceed the Standard & Poor's 500 Index for domestic equities and the Lehman Brothers Government/Credit Bond Index for fixed income securities.
- 3) Investment manager candidates must demonstrate the stability of the investment organization.

<sup>28</sup> Initial annual cash flow would be agreed upon by SRP and FWS. Future cash flow requirements would be adjusted for inflation as measured by an annual index calculated by dividing the U.S. Department of Commerce's final estimate of the chain-type annual weights price index for the Gross Domestic Product for the most recently completed third quarter by the value of that same index for the third quarter of the prior year.

additional obligations. While accounts are held or managed by SRP during the term of the permit: 1) SRP would supplement the principal in the accounts if income from the accounts falls below the annual cash-flow requirement; and 2) SRP may withdraw excess principal if the principal in the accounts exceeds the amount required to generate income to pay annual expenses.

### **3.4.2.5 Monitoring Measures**

SRP would monitor compliance with the terms and conditions of the ITP and the effectiveness of minimization and mitigation measures throughout the 50-year duration of the ITP. The goal for monitoring efforts is to assess the population status, trends, and habitat condition. Specific monitoring goals include:

- **Vegetation** — At Roosevelt, the goal is to monitor the density and distribution of riparian vegetation to assist in determining the timing of flycatcher and cuckoo surveys. At mitigation sites, the goal is to monitor the status of riparian and other vegetation to determine if management measures need to be implemented or modified.
- **Flycatchers** — At Roosevelt, the goal is to monitor habitat occupied by flycatchers to ensure compliance with the ITP, including whether adaptive management is required, and to detect long-term trends in population. At mitigation sites, the goal is to monitor species status and population trends.
- **Yuma Clapper Rails** — At Roosevelt, the goal is to monitor habitat occupied by Yuma clapper rails to ensure compliance with the ITP, including whether adaptive management is required, and to detect long-term trends in populations. At mitigation sites, the goal is to monitor species status and population trends.
- **Cuckoos** — At Roosevelt, the goal is to monitor habitat occupied by cuckoos to ensure compliance with the ITP, including whether adaptive management is required, and to detect long-term trends in populations. At mitigation sites, the goal is to monitor species status and population trends.
- **Bald Eagles** — The goal is to monitor population status by continuing the SRP contribution to the existing bald eagle monitoring program.

Table 6 indicates the timing and responsibilities for monitoring flycatchers, Yuma clapper rails, and cuckoos at Roosevelt, the conservation properties, and the Rockhouse Farm. Bald eagle monitoring would be conducted annually by AGFD and FWS.

An annual meeting would be held in October or November of each year between SRP, FWS, Reclamation, the Tonto Basin Forest Service District, AGFD, and the mitigation property managers to review the past year's information and to make decisions for the upcoming year regarding monitoring and management. SRP would provide an annual report to FWS (Arizona Ecological Services and Albuquerque Regional offices), Reclamation, and the Forest Service describing all RHCP activities occurring during the past year including management activities, results, status reports and future action items on mitigation properties, and all other activities associated with implementation of the RHCP. The draft annual report also would describe the past year's monitoring and management activities at mitigation sites, issues that have developed at the sites, adaptive

management efforts that have been implemented, and proposed monitoring and management efforts for the next year. A more complete description of proposed monitoring and reporting requirements is provided in Subchapter IV.E of the RHCP.

**Table 6. Flycatcher, Yuma clapper rail, and cuckoo monitoring schedule.**

| Year              | Habitat Conservation Properties |         | Roosevelt   |                                |                     | Rockhouse Site                               |                  |
|-------------------|---------------------------------|---------|-------------|--------------------------------|---------------------|--|------------------|
|                   | Flycatchers and Cuckoos         | Habitat | Flycatchers | Yuma Clapper Rails and Cuckoos | Riparian Vegetation | Flycatchers, Yuma Clapper Rails, and Cuckoos | Habitat Creation |
| 2003 <sup>1</sup> | †                               | ‡       | Reclamation | X                              | —                   | —  | X                |
| 2004              | †                               | ‡       | Reclamation | X                              | —                   | —  | X                |
| 2005              | †                               | ‡       | Reclamation | —                              | —                   | —  | X                |
| 2006              | †                               | ‡       | Reclamation | —                              | Reclamation         | —  | X                |
| 2007 to 2053      | ◇                               | ◇       | ◇           | ◇                              | X                   | ◇  | X                |

<sup>1</sup> Or first spring and summer following issuance of the ITP.

† Flycatchers and cuckoos will be surveyed by SRP during the first two years following acquisition.

‡ Baseline survey by SRP when the property is acquired to determine the quantity of mitigation credits on the property that meets the riparian habitat criteria.

◇ Variable frequency of monitoring by SRP to be determined by FWS and SRP depending on vegetation, population trends, and other factors. Monitoring of flycatchers, Yuma clapper rails, and cuckoos will be conducted on average every two years but at least every three years.

X Annual data collected by SRP except as noted in text.

### **3.4.2.6 Adaptive Management**

SRP would implement adaptive management at Roosevelt under the RHCP. Those adaptive management measures include: 1) mitigation of up to 500 additional acres occupied by flycatcher; 2) mitigation of up to 800 additional acres occupied by cuckoos; 3) mitigation of up to 5 acres of additional habitat occupied by Yuma clapper rails; and 4) implementation of various conservation, mitigation, or management measures in response to changed circumstances.

### **3.4.2.7 Additional Assurances (No Surprises) and Changed or Unforeseen Circumstances**

Two primary goals of the HCP program are: “(1) adequately minimizing and mitigating for the incidental take of listed species; and (2) providing regulatory assurances to Section 10 permittees that the terms of an approved HCP will not change over time, or that necessary changes will be minimized to the extent possible, and will be

agreed to by the applicant.”<sup>29</sup> Recognizing the importance of both of these goals, FWS has adopted “No Surprises” assurances, which address the allocation of responsibility for conservation and mitigation measures necessitated by the occurrence of changed or unforeseen circumstances affecting species that are covered by an ITP.

As part of the HCP development process, it is the goal of FWS, working with the permit applicant, to anticipate changes in circumstances that affect endangered species covered by the permit and include in the HCP appropriate conservation and mitigation measures to address those circumstances. At the same time, it was the intent of Congress, in enacting the “incidental take permit” provisions of the ESA, that should unforeseen circumstances occur, the permittee would not be required to assume responsibility for any additional measures deemed necessary to address those circumstances (ESA Section 10(a)(1)(b); 63 FR 8859 (February 23, 1998); 50 C.F.R. §§ 17.22(b)(5) and 17.32(b)(5)). The following section addresses the allocation of responsibility for conservation and mitigation measures necessitated by the occurrence of changed or unforeseen circumstances affecting species that are covered by the ITP.

**Changed Circumstances.** In developing the RHCP, SRP and FWS have identified specific “changed circumstances”<sup>30</sup> and have agreed upon the conservation and mitigation measures that SRP will implement in response to such “changed circumstances,” should they occur during the life of the ITP (Table 7).

So long as the terms of this RHCP are being properly implemented, FWS will not require the implementation of any conservation and mitigation measures in addition to those specified above. All other changes in circumstances affecting a species covered by the RHCP shall be deemed “unforeseen circumstances,” and shall be addressed as provided below.

**Unforeseen Circumstances.** In the event that significant unforeseen or extraordinary circumstances<sup>31</sup> occur during the life of the ITP, amendments to the RHCP may be proposed by either SRP or FWS to address these circumstances. Notwithstanding the foregoing, however, FWS shall not:

- Require the commitment of additional land, water or financial compensation by SRP; or
- Impose additional restrictions on the use of land, water or natural resources otherwise available for use by SRP under the original terms of the RHCP,

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<sup>29</sup> HCP Handbook, at 3-28 (FWS and NMFS 1996).

<sup>30</sup> The ESA’s implementing regulations define “changed circumstances” as “changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the FWS and that can be planned for.” 17 C.F.R. § 17.3.

<sup>31</sup> “Unforeseen circumstances” are defined as “changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the conservation plan’s negotiation and development, and that result in a substantial and adverse change in the status of the covered species.” 17 C.F.R. § 17.3.



including additional restrictions on the operation of Roosevelt Dam or other dams that are part of SRP's reservoir system to mitigate the effects of continued operation of Roosevelt.

**Table 7. Changed circumstances and conservation or mitigation measures to be implemented.**

| Changed Circumstances   | Conservation, Mitigation, or Management Measures   |
|---|--|
| Pilot project at Rockhouse is unsuccessful  | Acquire and permanently manage other riparian habitat  |
| Habitat protection and management measures at Roosevelt are ineffective   | Acquire and permanently manage other riparian habitat and implement other conservation efforts |
| Habitat acquisition and management in target area is infeasible   | Acquire and permanently manage other riparian habitat and implement other conservation efforts |
| Decline of population at mitigation sites   | Implement additional monitoring and management   |
| Invasion of exotic species at mitigation sites  | Implement eradication or control efforts   |
| Increase in occupied habitat at Roosevelt above 750 acres for flycatchers, 5 acres for Yuma clapper rails, or 313 acres for cuckoos | Acquire and permanently manage other riparian habitat and implement other conservation efforts |
| Reversion of title to Arizona or United States with loss of ability to achieve RHCP goal  | Acquire and permanently manage replacement habitat   |
| Habitat loss from scouring floods at Roosevelt or mitigation sites  | No additional measures by SRP  |
| Habitat loss from fire at Roosevelt or mitigation sites   | No additional measures by SRP  |
| Critical habitat designation for species covered by the RHCP  | No additional measures by SRP  |
| Downlisting or delisting the RHCP species due to recovery   | No changes in measures implemented by SRP  |
| Riparian restoration effort with the Fort McDowell Indian Community is unsuccessful   | No additional measures by SRP  |

**Monitoring and Reporting Requirements.** In order to ensure that appropriate measures can be taken in response to changed or unforeseen circumstances, SRP would include the following information in its annual monitoring reports:

- Any significant adverse trends of habitat or populations of listed and candidate species that are not anticipated by the RHCP.
- Any significant new information relevant to the RHCP that was unforeseen at the time the plan was approved.

If any of these significant changes are reported, they would be addressed as previously described for changed and unforeseen circumstances.

## **3.5 Alternative 3 — Re-operation of Roosevelt**

The Re-operation alternative would involve issuance of an ITP by the FWS, which would include measures to minimize or mitigate the potential take of federally listed species, and which would authorize incidental take as part of the changes in operations at Roosevelt. In an effort to reduce potential take, the operation of Roosevelt Dam would be changed in order to modify the timing, amount, frequency, and duration of water storage at elevations where riparian habitat currently exists. Although specified elevation levels would occasionally be exceeded due to high runoff, the reservoir level would be lowered to the specified elevation as soon as practicable.

### **3.5.1 Roosevelt Re-operation**

After consideration of many reservoir operation options, the release of water above elevation 2,125 feet was selected as the Re-operation alternative for further evaluation in the Draft EIS and RHCP. The selection of this alternative was based on the potential for reducing the impacts on listed and candidate species from re-operation of Roosevelt as described below.

An analysis of suitable habitat at Roosevelt indicates there is an inflection in the distribution of tall dense vegetation within the Roosevelt conservation space at an elevation of 2,126 feet (Figure 14). The inflection on the graph indicates that this is a break point in vegetation distribution—the quantity of tall dense vegetation per foot of increase in elevation increases more rapidly above elevation 2,126 feet, probably reflecting that this elevation is near the top of the historical maximum lake level at elevation 2,136 feet and has not been inundated for extended periods of time in contrast to lower elevations on the lakebed.

In addition, 60 percent of the flycatcher nests in 2001 occurred in vegetation having a root crown between elevation 2,115 and 2,125 feet, and 70 percent of the nests occurred above elevation 2,115 feet (Figure 16). Maintaining a maximum reservoir elevation of 2,125 feet would mean that the reservoir would be drawn down over the late spring and summer (flycatcher breeding season) to an elevation of 2,115 feet or less. This annual draw down of the lake level below elevation 2,125 feet would result in vegetation inundation only for a few winter months during high runoff years. The short period of inundation would enable vegetation to survive and be available for nesting in that year and successive years.

Also, selection of a maximum reservoir elevation of 2,125 feet is close to the midpoint between elevations 2,095 and 2,151 feet, the maximum lake levels under the No Action and Full Operation alternatives, respectively. Thus, elevation 2,125 feet represents a middle point on the continuum of biological and socioeconomic impacts between the No Action and Full Operation alternatives.

Similar to the No Permit alternative, a reduction in water conservation storage would increase flood conservation storage. The increased flood storage capacity of 460,000 AF would require modifications to the Modified Roosevelt Water Control Manual (Corps 1997). Any changes in flood control operations that affect federally listed species would be subject to consultation under Section 7 of the ESA by the Army Corps of Engineers.

### 3.5.2 Options to Minimize, Mitigate, and Monitor the Effects of Roosevelt Re-operation

Although potential take would be reduced under this Alternative 3, mitigation measures would be required for take occurring below elevation 2,125 feet. Mitigation measures would include acquisition and management of riparian habitat elsewhere in Arizona similar to those described previously for Alternative 2 and in the RHCP, but for a small number of acres.

Estimated impacts to flycatcher habitat of 250 acres, as discussed in Chapter 4, would require 750 acres of mitigation. Reclamation's existing and planned habitat acquisition and management of about 820 acres would meet the mitigation requirements for flycatchers. Inundation of about 4 acres of Yuma clapper rail habitat would be mitigated by creation of 5 acres of marsh habitat on the Rockhouse Farm property along the Salt River arm near Roosevelt. SRP and Reclamation would implement habitat acquisition, management, and monitoring measures for bald eagles similar to those described for Alternative 2. Potential impacts to cuckoo habitat of 60 acres also would be addressed by Reclamation's habitat acquisition of about 550 acres of habitat suitable for cuckoos.

### 3.6 Alternatives and Mitigation Measures Eliminated from Further Consideration

A number of alternatives, including certain minimization or mitigation measures for biological and socioeconomic impacts, were determined to be infeasible, would not meet the project purposes, or were simply minor variations on the three alternatives summarized above. The alternatives that were rejected and the reasons for elimination are summarized in Table 8 and described in the remainder of this section.

**Table 8. Alternatives eliminated from further consideration (retained alternatives noted where applicable).**

| ALTERNATIVE OR MEASURE   | REASONS FOR ELIMINATION   |
|--|---|
| <b>Jurisdictional</b>  |   |
| Section 7 Consultation between Reclamation and FWS                             | <ul style="list-style-type: none"> <li>• SRP's continued operation of Roosevelt is not a Federal action</li> </ul>  |
| <b>Reservoir Re-Operation Alternatives</b>                                     |   |
| Breach Roosevelt Dam   | <ul style="list-style-type: none"> <li>• Defeats project purpose</li> <li>• Permanently reduces riparian habitat</li> <li>• Large socioeconomic and environmental impacts</li> </ul>  |
| Other Changes to Roosevelt Operations  | <ul style="list-style-type: none"> <li>• Options limited by high variability of runoff</li> <li>• Not entirely eliminated — One mid-range alternative selected for further study</li> </ul>   |
| Change Verde Operations (modify reservoir fill, releases, or sediment capture) | <ul style="list-style-type: none"> <li>• Options limited by high variability of runoff</li> <li>• Impact on complex contracts with Tribes, mining company, and City of Phoenix</li> <li>• Limited benefits to riparian vegetation</li> <li>• High cost</li> </ul> |

| ALTERNATIVE OR MEASURE  | REASONS FOR ELIMINATION  |
|---|--|
| <b>Measures to Minimize or Mitigate Impact on Listed Species — Salt and Verde Watersheds</b>                |  |
| Protect riparian habitat on private land  | <ul style="list-style-type: none"> <li>• Opportunities are limited</li> <li>• Not entirely eliminated — protection of existing riparian habitat on private land along the Verde is one component of RCHP</li> </ul>      |
| Restore riparian habitat on private land  | <ul style="list-style-type: none"> <li>• Opportunities are limited due to narrow floodplains and high gradient</li> <li>• Not entirely eliminated — one component of RHCP</li> </ul>                                     |
| Protect and restore riparian habitat on public land   | <ul style="list-style-type: none"> <li>• Subject to 7(a)(1) and (2) of ESA</li> <li>• Limited amounts available</li> <li>• No SRP control</li> <li>• Not entirely eliminated, one potential component of RHCP</li> </ul> |
| <b>Measures to Minimize or Mitigate Water Supply Impacts Resulting from Changes in Reservoir Operations</b> |  |
| Additional ground water pumping   | <ul style="list-style-type: none"> <li>• Severely limited by Arizona Groundwater Management Act</li> </ul>   |
| Reduction of water use through conservation measures  | <ul style="list-style-type: none"> <li>• Already being implemented as required by the Arizona Groundwater Management Act</li> </ul>  |
| Recharge of water that cannot be stored at Roosevelt  | <ul style="list-style-type: none"> <li>• Severely limited by legal, institutional, practical, and cost constraints</li> </ul>  |
| Use of CAP water  | <ul style="list-style-type: none"> <li>• Limited by availability and cost</li> </ul>   |
| Use of effluent   | <ul style="list-style-type: none"> <li>• Limited by availability, practical considerations and cost</li> </ul>   |
| Acquisition of water from other sources or water users  | <ul style="list-style-type: none"> <li>• Limited quantity is available locally; importing large amounts is infeasible</li> </ul>   |
| <b>Measures to Minimize or Mitigate Power Supply Impacts Resulting from Changes in Reservoir Operations</b> |  |
| Construct new transmission  | <ul style="list-style-type: none"> <li>• Loss of Roosevelt generation may require construction of new transmission or generation facilities (see below)</li> </ul>   |
| Purchase replacement power  | <ul style="list-style-type: none"> <li>• Increases risks associated with price volatility and less reliable power</li> <li>• Increases emissions levels</li> </ul>   |
| Construct new generation  | <ul style="list-style-type: none"> <li>• May not be permitted due to air quality issues</li> <li>• Increases emissions levels</li> </ul>   |
| Use of renewable energy   | <ul style="list-style-type: none"> <li>• Currently not a cost-effective alternative</li> </ul>   |
| Increased energy conservation   | <ul style="list-style-type: none"> <li>• Already being implemented</li> </ul>  |

### **3.6.1 Section 7 Consultation Between Reclamation and FWS**

This alternative would involve reinitiation of consultation between FWS and Reclamation and, if appropriate, issuance of an incidental take statement by FWS to Reclamation. The proposed action would be expanded from that addressed in the 1996 consultation to include operation of all conservation storage at Roosevelt rather than just construction and inundation of the NCS between 2,136 and 2,151 feet in elevation.

Section 7 is limited to Federal agency action; its consultation requirements apply only to activities “authorized, funded or carried out” by Federal agencies. The previous Section 7 consultation between FWS and Reclamation, completed in 1996, addressed Reclamation’s modifications to Roosevelt Dam, including the construction of NCS and flood control space above elevation 2,136 feet. The consultation also addressed the effect of Reclamation’s action—the eventual inundation of the new reservoir space above elevation 2,136 feet.<sup>32</sup> SRP’s operation, storage and release of water for the original Roosevelt Dam, for which it has been responsible for the last 85 years, was not the subject of Reclamation’s action. Accordingly, the 1996 consultation did not address SRP’s operation of the original conservation space, where the majority of breeding sites for flycatchers are presently located.

The 1996 Section 7 consultation also did not address SRP’s ongoing, long-term operation of all the conservation storage space at Roosevelt Dam, the action that is the subject of this RHCP and accompanying application by SRP for an ITP. SRP is vested with the authority over and responsibility for the operation of conservation storage at Roosevelt Dam, through its 1904 and 1917 contracts with the Secretary of the Interior, and, subsequently, the 1993 Contract authorizing SRP to operate the NCS constructed by Reclamation. The action addressed by SRP’s application for an ITP (ongoing, long-term operation of conservation storage) is SRP’s action, and not the proposed action of any Federal agency. As such, it is appropriate to address the effects of SRP’s operation of conservation storage at Roosevelt Dam pursuant to Section 10 of the ESA.

For these reasons, the alternative of a Section 7 consultation between Reclamation and FWS to address SRP’s operation of conservation storage was eliminated from further consideration and the impacts of this alternative are not considered in Chapter 4.

### **3.6.2 Breach Roosevelt Dam**

This alternative would involve breaching Roosevelt Dam in an effort to avoid potential take. The elimination of Roosevelt Lake would ultimately result in the dramatic reduction of riparian habitat at Roosevelt because the combination of deltas formed and maintained by the lake and saturation of those deltas by reservoir operations has created much of the riparian habitat at Roosevelt. Also, this alternative was determined to be

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<sup>32</sup> See memorandum to David Harlow, U.S. Fish and Wildlife Service, from Carol Erwin, U.S. Bureau of Reclamation, dated January 5, 2000, p. 1; letter to John F. Sullivan, Associate General Manager, Salt River Project, from David Harlow, U.S. Fish and Wildlife Service, dated March 2, 2000, p. 1; both citing the 1996 BO addressing Reclamation’s 1995 BO.

infeasible because it defeats the purpose of SRP's operation of Roosevelt to provide water and power to the Phoenix area. Moreover, there would be enormous socioeconomic and environmental impacts resulting from the loss of water supply, flood control, and recreation benefits provided by Roosevelt.

### **3.6.3 Other Changes in Roosevelt Operations**

A number of Roosevelt operational alternatives were identified by SRP, the FWS, and the public. Each of those alternatives was carefully considered and one, Alternative 3—Re-operation alternative, was selected for further analysis. Several other operational alternatives that were considered in the EIS and the RHCP and eliminated from further consideration are described below.

#### ***3.6.3.1 Reservoir Management to Enhance Riparian Habitat***

In the 1996 BO on Modified Roosevelt, FWS considered reservoir management to slowly increase maximum reservoir levels in order to promote vegetation growth at higher and higher elevations within the reservoir thereby avoiding sudden impacts to riparian habitat (FWS 1996, pp. 28, 29). The FWS determined this alternative to be infeasible “because of the difficulty of balancing water needs for developing habitat with the need to avoid destroying existing habitat or affecting reproductive attempts through prolonged inundation” (Id.). This alternative was reconsidered during development of the RHCP and it was determined that reservoir operation alternatives that attempt to manage reservoir elevation over time are infeasible because reservoir fluctuations are largely determined by the extent, duration and frequency of runoff, factors beyond the control of SRP. Runoff into Roosevelt is highly variable, with long-term cycles of drought and flood, which prevent a sequential increase in reservoir level, or most other types of specific control of reservoir elevation.

An alternative similar to managing reservoir levels in order to enhance riparian habitat would be to store water in the winter and then release it in the spring before the flycatchers return to breed and nest. However, late season storms may result in high inflow during late March and April, which would prevent the use of this alternative because there would be too great of risk of not being able to release enough water prior to the onset of the breeding season for flycatchers and, thus, there could be inadvertent take. Also, inundation of vegetation may result in debris being deposited in the branches of vegetation that would otherwise be used for nesting by flycatchers, possibly precluding use by flycatchers (FWS 1996, p. 21). This alternative provides only marginal additional water storage in the winter when less water is needed. In many years, large spring releases would: 1) negate the benefit of winter storage; and 2) result in the loss of hydropower production during the peak period. Moreover, there is a risk of inundating flycatcher habitat during the breeding season. This alternative was eliminated because few benefits are realized for listed species, but there are large impacts to water supply and power generation.

### ***3.6.3.2 Various Other Limits for Maximum Reservoir Elevation and Timing of Fill***

A wide variety of operational rules that would limit reservoir fill to certain times of the year, certain years, or various elevations were considered. These alternatives lie in the range between Full Operation of Roosevelt (proposed action) and the No Action alternative of maintaining the reservoir below the lowest current nesting elevation.

For the reasons discussed in the previous section, management of the reservoir to meet specific reservoir elevations at particular times of the year is not feasible. Thus, it was determined that the only feasible operational alternatives involve a fixed constraint on the maximum elevation of conservation storage. As previously described, Alternative 3 was selected to represent a mid-point on the continuum between the Full Operation and the No Action alternatives.

### **3.6.4 Change Verde River Reservoir Operations**

Riparian habitat suitable for flycatchers from Horseshoe Reservoir to the mouth of the Verde River is limited, although recently flycatcher activity at the Horseshoe Reservoir inlet has been observed. At the suggestion of the public, several alternatives involving changes in operation of SRP's Verde reservoirs were reviewed in order to potentially create or enhance riparian habitat that is likely to be used by flycatchers at or downstream of the reservoirs. These alternatives included modifying the timing and extent of fill, releasing water to mimic the natural hydrograph, and providing sediment to the Verde downstream of Bartlett Dam.

#### ***3.6.4.1 Modifying the Timing and Extent of Fill***

Alternatives that involve modifying the timing or extent of fill of the Verde reservoirs primarily would involve changing the operation of the Verde dams to create and maintain riparian vegetation at Horseshoe Reservoir, which has topographic and soil characteristics potentially more suitable for vegetation growth than Bartlett Reservoir. As with similar alternatives for Roosevelt, it was concluded that reservoir operation alternatives that attempt to proactively manage reservoir elevation over time to maintain vegetation are infeasible because reservoir fluctuations are significantly affected by the extent, duration and frequency of runoff, and land use along the lower Verde River, factors beyond SRP's control. Therefore, these alternatives would provide little or no improvement of riparian habitat for flycatchers.

In addition, Bartlett and Horseshoe dams are operated pursuant to a complex set of Congressionally approved water right settlements and contractual relationships involving the Salt River Pima-Maricopa Indian Community, Fort McDowell Indian Community, United States, City of Phoenix, and Phelps Dodge. Modifying the operation of one or both of the Verde dams would have significant impacts on these water users. These contractual water users would have strong legal grounds to enjoin any modification of the operation of the Verde dams absent an overriding reason such as protecting the safety of the dams, maintenance requirements, or avoiding Section 9 take of listed species at the Verde reservoirs.

For the reasons described above, modifying the extent and timing of fill of the Verde reservoirs was determined to be infeasible and these alternatives were eliminated from further consideration.

#### ***3.6.4.2 Releases of Water to Mimic the Natural Hydrograph***

The Flycatcher Recovery Team Recommendation for flycatchers suggests that reservoir operations be modified to benefit downstream riparian habitat (FWS 2001b, pp. 98, 99, Appendices I and J). Specifically, the Recommendation identifies “loss of annual peak flows, frequent loss of low flows, loss of flow variability at all levels, and sediment starvation (fine materials)” as effects of SRP’s Verde River dams (Id., p. J-31).<sup>33</sup> In light of this guidance and public input, SRP evaluated this alternative.

SRP has conducted extensive studies along the lower Verde River since 1985 to assess the hydrological and environmental impacts of dam operations (ERO 1986; SRP 2002b). This work has focused on riparian vegetation communities, including evaluation of surface and ground water hydrology, ground and aerial vegetation surveys, analysis of historical aerial photos dating from 1934, coring of cottonwoods to determine age, and soil studies. Findings from these studies are summarized below:

- Alterations of the flow conditions from reservoir operations in the lower Verde River have reduced the frequency and density of cottonwood establishment and survival, although these processes continue to occur in the active floodplain. However, as noted below, broad, extensive areas of riparian woodland were not present historically and land use appears to be a limiting factor for cottonwood regeneration (ERO 1986).
- Given the relatively small size of the SRP reservoirs on the Verde, the natural hydrograph has not been substantially modified by operation of the reservoirs (SRP 2002b; see FWS 2001b, p. J-9).
- Unregulated Verde River flow prior to reservoir construction did not support extensive cottonwood galleries or broad areas of riparian vegetation within the river’s floodplain; the distribution of cottonwood remains today, as it has historically, as isolated stands. Some cottonwood regeneration continues to occur; for example, a number of saplings near the Beeline Bridge resulted from high flow events in 1979 and 1980. Similarly, other riparian vegetation continues to occur mostly as strands along the river banks (ERO 1986; 1934 photos on file at SRP).
- Minimum stream flows would have a slight beneficial effect on sustaining riparian vegetation. A minimum flow of 100 cfs released from Bartlett Dam was incorporated into the Fort McDowell Indian water rights settlement and has been in effect since 1994 (ERO 1986; see Appendix 1 of the RHCP).<sup>34</sup>

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<sup>33</sup> SRP has identified flaws in the hydrological analysis on which this statement is based (SRP 2002b).

<sup>34</sup> Appendix J (p. J-9) of the Flycatcher Recovery Team recommendation (FWS 2001b) does not reflect these minimum flows.



- Succession of cottonwood galleries and other riparian vegetation is a combination of natural fluctuations and man-induced changes, including such factors as natural channel migration, land use, and water regulation. Minimum flows higher than 100 cfs would have little benefit in maintaining mature cottonwoods or in facilitating regeneration of cottonwoods or other riparian vegetation because 100 cfs is adequate to maintain a stable ground water table under the floodplain in the absence of pumping large amounts of water from wells (ERO 1986).
- Sediment availability and flow alteration may not be major constraints to riparian restoration between Horseshoe Dam and Needle Rock above the Fort McDowell Reservation. A relatively high-gradient channel and riparian land uses (e.g., grazing) appear to be the biggest factors limiting riparian vegetation in this reach (Graf, pers. comm. 2001). In support of that hypothesis, the reach of the Verde River above the dams (between the lower end of the Verde Valley and Horseshoe, an area subject to unregulated flows) is in similar condition to the lower Verde (Id.).
- Recreational use of riparian areas and grazing by cattle and horses are major impacts on cottonwood/willow communities along the lower Verde. Nearly all of the riparian land use along the lower Verde is subject to the jurisdiction of the Forest Service or the Fort McDowell Indian Reservation. As a result, recruitment of new trees and shrubs from the high flow events since the late 1970s has been limited or nonexistent. Management of recreation use and livestock grazing has the greatest potential to promote perpetuation of cottonwood and willow on the Reservation (Id.).
- River morphology has not changed significantly since the construction of Bartlett Dam (Id.).
- Vegetation density on the active floodplain of the lower Verde River has increased since 1934 when river flows became regulated as the result of the construction of Bartlett Reservoir. This increase in density may be the result of salt cedar invasion (Turner 1974).
- High bank cottonwoods, which have been the focus of concern due to bald eagle nests, are overly mature. These cottonwoods appear to be decadent primarily as a result of age and disease and a declining water table due to the natural migration of the channel (ERO 1986).
- Options for perpetuating cottonwood stands and other riparian vegetation include:
  1. Attempting to maintain current population levels in an unmanaged state under current flow regulation and land use;
  2. Restocking by direct plantings; or
  3. Attempting regeneration by topographic management of the floodplain and/or flow regulation.
  4. Removal of cattle and management of human impacts (Id.).
- Options attempting to create regeneration by manipulating flows are unlikely to produce predictable results, in part because the sediment supply is limited (see next section).

Another consideration on the Verde River is that storage facilities are not available downstream of Bartlett Dam to capture releases that exceed water demand. Thus, the range of flow variation downstream of Bartlett Dam without losing water over Granite Reef Dam is limited to a few hundred to about 3,000 cfs depending on the water demand at Granite Reef. Some flow manipulation between Horseshoe and Bartlett is possible but the range, amount, and duration of flow is limited by the relatively small storage capacity of these two reservoirs. If releases of water greater than demand were made to benefit riparian habitat, that water would be lost from diversion at Granite Reef Dam, thus reducing water supplies for SRP shareholders and contractors.

Given the findings that additional releases of water from the Verde dams to mimic the natural hydrograph: 1) would provide limited benefit to riparian vegetation along the lower Verde River without land use changes beyond SRP's control; and 2) would potentially reduce water supplies to SRP and its contractors, this alternative was eliminated from further consideration.

#### ***3.6.4.3 Providing Sediment to the Lower Verde***

In some locations, scientists find that riparian vegetation is limited in river reaches downstream of dams because of a lack of sediment (FWS 2001b, pp. 33, 100, J-10). Dr. Julie Stromberg, a member of the flycatcher recovery team, suggested that SRP investigate the feasibility of bypassing sediment from above Horseshoe Reservoir to downstream of Bartlett Dam (Stromberg, pers. comm. 2001a). As a result of that suggestion, several alternatives to provide sediment to the lower Verde were evaluated by SRP. These alternatives are discussed below.

Passing of sediment can be accomplished through diversion dams where relatively high water velocities can be maintained, but not in storage reservoirs where large pools of water form during high inflows. It was concluded that it was not feasible to operate the Verde reservoirs to pass significant amounts of sediment through the dams because these large pools slow water velocity and cause sediment to fall from suspension. Thus, mechanical measures to transport sediment around the Verde reservoirs were evaluated.

A reconnaissance cost estimate to haul sediment by truck from Horseshoe to the foot of Bartlett Dam was developed. The estimate is based on transporting about 4 AF of silt per year (about 8,500 cubic yards around the dams).<sup>35</sup> The initial costs of extending the roads to the loading and unloading locations is relatively small, about \$100,000. However, the annual costs are quite large. Loading, hauling and dumping the sediment is estimated to cost about \$400,000 per year. Most of this sediment would not be permanently deposited along the stream but would eventually be transported by the Verde River to SRP's Granite Reef Diversion Dam where it would need to be dredged out again. Assuming that 75 percent of the additional sediment would reach Granite Reef, the estimated dredging cost would be about \$600,000 per year. With annual costs

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<sup>35</sup> The average annual sediment inflow to Horseshoe is estimated to range from about 400 to 650 AF (Corps 1981, p. 32). Transportation of this large amount of sediment was determined to be extremely costly, so one percent of the lower end of the range was used for a feasibility analysis.

estimated at about \$1 million, uncertain benefits to riparian vegetation (see previous section), and potential impacts to bald eagles, aquatic life, and other wildlife from heavy equipment operations, this alternative was determined to be infeasible.<sup>36</sup>

A slurry pipeline to convey sediment also was evaluated. The capital cost to construct a pipeline and provide power to the system is estimated to exceed \$8 million. Annual costs, including increased dredging of Granite Reef, are estimated to be about \$700,000. This alternative also was determined to be infeasible given the high capital and annual costs, uncertain biological benefits to protected species, and adverse environmental impacts. In addition, Clean Water Act permitting may be difficult to obtain because of potential water quality concerns with adding sediment to the Verde River.

For the reasons described above, the alternatives to provide sediment to the lower Verde as a means of restoring riparian vegetation to mitigate for impacts at Roosevelt were eliminated from further consideration.

### **3.6.5 Measures to Minimize or Mitigate Impacts on Listed Species Through Protection or Restoration of Riparian Habitat in the Salt and Verde Watersheds**

Many alternative measures to minimize or mitigate impacts of Roosevelt operations on listed species were examined. Feasible measures were incorporated into the RHCP. Infeasible measures and the reason(s) for elimination from further consideration are briefly summarized below.

#### ***3.6.5.1 Protect Riparian Habitat on Private Land***

An intensive search for suitable riparian habitat that is likely to be used by flycatchers on private land was conducted in the Salt River watershed. The search focused on private inholdings within the Tonto National Forest along Tonto Creek, the Salt River, Cherry Creek, Pinal Creek, and Pinto Creek. Although a few small areas of good quality riparian vegetation were identified, there are no records of flycatchers nesting in or adjacent to these areas. The Carlota Mine site near Pinto Creek was eliminated from further consideration due to the relatively small size of the parcel, narrow floodplain, steep gradient, and historical water quality problems.

Similarly, private land along the Verde River and its tributaries was intensively searched for suitable riparian habitat that is likely to be used by flycatchers. The search along the Verde River was aided by the assessment of habitat acquisition priorities prepared by The Nature Conservancy (TNC 1999a). Based on criteria in the Recommendation, highest priority was placed on occupied, unprotected riparian habitat

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<sup>36</sup> Dredging sediment from Horseshoe would provide benefits to SRP by extending the effective life of the reservoir and increasing storage capacity. However, these benefits are small unless very large amounts of sediment are dredged annually. It is unlikely that dredging large amounts of sediment would prove to be cost-effective given that the cost of moving sediment is about \$250,000 per AF.

and nearby suitable riparian habitat identified in existing documents (FWS 2001b), p. 81). In recent years, the only recorded nesting flycatchers along the Verde have been near Camp Verde. This area is included as a high priority mitigation area in the RHCP. Surveys in 2002 also discovered flycatcher activity at the inlet to Horseshoe Reservoir.

#### ***3.6.5.2 Restore Riparian Habitat on Private Land***

High priority was placed on identifying private lands where suitable riparian vegetation suitable for flycatcher use could be established or restored. The search focused on Tonto Creek between Roosevelt and Gisela, Greenback Creek (a tributary of Tonto Creek), Pinto Creek, and the Salt immediately above Roosevelt. Except for several parcels of Reclamation fee land on the Salt River near Roosevelt that are included in the RHCP (known as part of the Rockhouse Farm or “Rockhouse”), these areas were eliminated from further consideration due to the small size of the parcels, high gradient of the stream channels, narrowness of the floodplains, or lack of reliable water supplies.

A pilot project to evaluate the feasibility of irrigation of the Rockhouse property to establish riparian vegetation was selected from a group of options that were studied. Several other alternatives at Rockhouse were rejected due to high cost. These alternatives involved excavation in order to lower all or a portion of the area to an elevation approximating the river level and ground water table. Excavation options were examined ranging from about 4 acres to 80 acres. The total estimated cost for these options ranges from about \$700,000 (for 4 acres) to over \$8 million (for 80 acres) for engineering, excavation and revegetation. Because costs exceed \$100,000/acre and it is not clear that such an effort would be successful in establishing high quality riparian vegetation, these options were eliminated from further consideration.

In addition, protection and restoration of riparian vegetation on private land along the Verde River in the Verde Valley near Camp Verde is a high priority component of the RHCP. Additional restoration efforts on private land in the Verde Valley may be included but opportunities are limited due to the relatively narrow width of the floodplain, small parcel size, pressure from urbanization, and high land costs.

#### ***3.6.5.3 Protect and Restore Riparian Habitat on Public Land***

As with private land, an intensive search for suitable riparian habitat that is likely to be used by flycatchers on public land was conducted in the Salt and Verde watersheds. The search found a few small areas of good quality riparian vegetation, but all are limited in existing and potential size. Along the Verde, there are records of flycatchers nesting in or adjacent to some of these areas. In addition, there are lands within the floodplain that might be restored, but the Forest Service is already working in some of these areas to improve riparian vegetation.

The Forest Service manages much of the land along the Salt River, Tonto Creek, and Verde River. Only a few areas with the potential for restoration through intensive management such as fencing, planting and irrigation were identified. The remaining National Forest lands were determined to be unsuitable for efforts to develop riparian vegetation that is likely to be used by flycatchers due to the narrow width of the floodplain and high stream gradient.

One alternative suggested during scoping is to minimize or mitigate the impact of Roosevelt operations by greater management of livestock grazing on Tonto National Forest lands. Public land along an 18-mile reach of Tonto Creek above Roosevelt is being managed by the Tonto National Forest to benefit riparian vegetation as part of the Tonto Creek Riparian Unit (TCRU) (Garcia and Associates 2001, p. 1-3). The TCRU was funded by Reclamation pursuant to the amended Fish and Wildlife Coordination Act report prepared by the FWS and Clean Water Act Section 404 permit requirements for the construction of Modified Roosevelt and New Waddell dams (Id., p. 1-1). Restoration and maintenance of riparian vegetation were to be accomplished by fencing and grazing management of the TCRU (about 6,872 acres of public lands) and other grazing allotments around Roosevelt Lake (Id., pp. 1-1 and 1-2). The monitoring report on the TCRU concludes that riparian vegetation along Tonto Creek has improved, including new cottonwood-willow acreage, but it is uncertain if all of the new vegetation will persist after future flood events (Id., p.1-5). Recommendations for future efforts include: 1) maintenance of fencing, 2) limiting grazing to the winter months with rest years, and 3) increased staff time to minimize trespass cattle and impact from recreation or other land uses (Id., pp. 5-12 to 5-14).

Additional management of livestock grazing or other measures to protect or improve riparian habitat on National Forest lands were eliminated from further consideration in the RHCP because Federal agencies already have a duty to manage these lands for listed species subject to Section 7(a)(1) and (2) of the ESA. One alternative suggested during scoping is to retire Federal grazing rights along Pinto Creek. These grazing allotments fall within the Tonto National Forest; therefore, this alternative is already subject to Section 7(a)(1) and (2) of the ESA. However, if unique circumstances are found where measures to protect or improve riparian habitat on Federal land would benefit listed species and Section 7 consultation is inadequate to achieve these benefits, SRP and FWS may agree to implement those measures as part of additional conservation under the RHCP.

In the 1996 BO on Modified Roosevelt, FWS considered two alternatives for creation of new riparian habitat: 1) irrigation along the abandoned power canal that runs along the south side of Roosevelt, or 2) creation of spoil islands near elevation 2,151 feet (FWS 1996, p. 29). The alternative of using the power canal was determined to be infeasible “because riparian habitat created would most likely consist of very narrow, linear patches parallel to the canal, which are not considered suitable habitat” (Id.). The alternative of constructing spoil islands was determined to be infeasible “because the probability of establishing suitable habitat for southwestern willow flycatchers was considered low and the probability of a flood eroding away the spoil piles was considered high” (Id.). These options were reconsidered during development of the RHCP, and again it was concluded that these alternatives are unlikely to provide long-term, suitable riparian vegetation that is likely to be used by flycatchers.

Two areas on Reclamation withdrawn lands identified to have potential for restoration are included in the RHCP as potential mitigation sites. These areas would involve irrigation of riparian land along the Salt River just upstream of Roosevelt.

Another alternative examined at the Salt River inlet to Roosevelt was the construction of a grade control structure (low dam) across the floodplain slightly above elevation 2,151 feet. The purpose of the structure would be to redistribute water and sediment above and downstream of the dam to promote riparian vegetation growth and to minimize the impact of floods on existing riparian vegetation downstream of the structure. Due to the width of the floodplain (about 2,500 feet), size of inflows (exceeding 200,000 cfs), and the depth of the alluvium (estimated to be greater than 20 feet), the grade control structure would require over 32,000 cubic yards of concrete for construction. The total construction cost was estimated to exceed \$35 million. Given the high cost of the structure and the small amount of vegetation that would be created or protected (estimated at 200 to 300 acres), this alternative was determined to be infeasible and eliminated from further consideration.

### **3.6.6 Measures to Minimize or Mitigate Water Supply Impacts Resulting from Changes in Reservoir Operations**

Conceptually, there are a number of alternative measures that SRP and other water users that benefit from Roosevelt could use to minimize or mitigate water supply impacts resulting from changes in reservoir operations. One of these measures, use of effluent, is considered to be feasible at least to replace a portion of the water supply lost under Roosevelt operation alternatives. However, as discussed below, other alternatives are quite limited. Competition for water resources in central Arizona is very high given the limited water supply and growing population (ADWR 1994, pp. xxxi – xxxiv). As a result, many of these water supply alternatives are already being pursued to the maximum extent possible. For example, purchase and retirement of agricultural lands is a source of future water supply that is occurring steadily through urbanization and is already being pursued by municipal providers. For other alternative water supplies, the opportunities to minimize or mitigate impacts using these replacement supplies are limited due to numerous legal and institutional constraints (e.g., state and Federal law including Arizona's Groundwater Management Act, court decrees, agreements, and contracts).

#### **3.6.6.1 Additional Ground Water Pumping**

Because the dependable surface water supply in Arizona is insufficient to meet demand, water users have relied for decades on mining ground water to meet their needs. In 1980, the legislature recognized that in many basins withdrawal of ground water exceeded the safe annual yield, which threatened the general economy and welfare of the state and its citizens. The legislature enacted the Groundwater Management Act, A.R.S. §§ 45-401 et seq., restricting the use of ground water in Active Management Areas (AMAs) where the ground water overdraft is most severe. SRP, cities, and other entities that receive water from SRP are located within the Phoenix AMA. The Act imposes many limits on the use of ground water in the AMAs:

- The Act prohibits residential development unless there is a 100-year assured water supply (AWS) available for the development. A.R.S. § 45-576. Most municipal water providers have qualified for and maintain a designation of assured water supply by demonstrating that sufficient water is physically, legally and continuously available to meet a projected future water demand for at least

100 years. Under these designations, the volume of ground water that may be pumped by each designated water provider in the Phoenix AMA typically represents less than 10 percent of the provider's demand. Most of the supply must be derived from other sources. The Arizona Department of Water Resources (ADWR) regularly reviews the AWS of designated providers, and may terminate a designation if a water provider is unable to maintain sufficient qualifying water supplies. All the cities that receive Salt and Verde river water delivered by SRP rely on that water as a significant component of their AWS designation.

- The Act requires that all water users in the AMAs comply with mandatory conservation regulations specified in a series of management plans designed to reduce ground water use. The management goal for the Phoenix AMA is safe-yield. ADWR has adopted the Third Management Plan for all AMAs for the period 2000 to 2010. Under the plan for the Phoenix AMA, municipal water providers must comply with a gallons per capita per day program or an alternative conservation program approved by ADWR.
- The Act restricts the geographic area in which municipal ground water pumping is allowed, and requires a permit to drill a new well. The Act permits a city to pump ground water only within its service area, which is the land actually being served water by the city and any additional areas that contain an operating distribution system owned by the city. A.R.S. §§ 45-492, 45-402. A city may not extend its service area to expand its access to ground water. A.R.S. § 45-493. A city may drill a new well in its service area only after demonstrating to ADWR that the new well will not unreasonably increase damage to surrounding land or other water users. A.R.S. § 45-598.
- The Act prohibits, with limited exceptions, pumping and transporting ground water from outside an AMA for use within an AMA. Although ground water withdrawal outside the AMAs is regulated less stringently than within the AMAs, very little ground water is legally available to the cities because the legislature has forbidden its use within the AMAs. A.R.S. § 45-551.
- Violations of the Act are punishable by civil and criminal penalties. ADWR may inspect property to determine compliance with the Act, and may issue cease and desist orders for violations. A.R.S. §§ 45-633, 45-634. Violators are subject to civil penalties of up to \$10,000.00 per day, and criminal charges ranging from misdemeanor to felony counts. A.R.S. §§ 45-635, 45-636.

Thus, the requirements of the Groundwater Management Act preclude the use of ground water as a replacement supply for Salt and Verde river water that would be lost to the cities if SRP's reservoir operations are changed. Because the majority (and ever-increasing proportion) of SRP water use is supplied for municipal use, replacement of water supplied by Roosevelt with additional ground water pumping in the Phoenix AMA is not a feasible alternative and was eliminated from further consideration.

### ***3.6.6.2 Reduction of Water Use Through Conservation Measures***

Cities and other water users dependent on water from Roosevelt potentially could more fully utilize available water supplies through implementation of water conservation measures (also known as water demand management programs) in order to offset the loss of water supplies from Roosevelt. However, these measures already are being implemented as a result of intensive regulation under Arizona's Groundwater Management Act in order to conserve ground water (see previous section)

For example, the cities in SRP's service area have implemented several wide-ranging conservation programs since enactment of the Groundwater Management Act in 1980 that have been very successful. Conservation initiatives include low-flow plumbing fixture codes, local ordinances governing water intensive landscaping, landscape conversion and plumbing retrofit rebate programs, public information and education programs, commercial and industrial conservation programs, and water conservation grant programs. The "Water—Use It Wisely" campaign has won numerous local and national awards, including Valley Forward's Crescordia Award for Environmental Education. A follow-up study shows that 69 percent of Valley residents recall the campaign, and the number of residents seeing or hearing about steps they can take to conserve water has increased from 20 percent to 55 percent. Ninety-six percent of Valley residents report that they have taken steps to conserve water.

Xeriscape educational programs have been instrumental in reducing the number of lawns and water-intensive landscaping installed with new homes. A 1999 study showed that 70 percent of new homes installed xeriscapes, up from 20 percent in 1985. The cities, through the Arizona Municipal Water Users Association (AMWUA) Regional Water Conservation Committee, received an award from the Arizona Nursery Association for their efforts in promoting the xeriscape concept.

Water conservation efforts have been effective in slowing the growth of demand for water. The population of the Phoenix AMA increased from 1,452,305 in 1980 to 2,696,315 in 1998, an increase of 86 percent. During the same period, municipal water use in the Phoenix AMA increased from 528,000 AF to 718,483 AF, an increase of only 36 percent.

The cities' existing planning processes for meeting future demands within their service areas already recognize the savings attributable to water conservation. The cities' ability to meet water demands with currently available and future water supplies is premised on the success of their conservation programs and resultant water savings. Because the cities have already undertaken aggressive conservation measures as required by the Groundwater Management Act, there is little or no opportunity to replace the loss of water supply from Roosevelt under the No Action or Re-operation alternatives through water conservation. Thus, water conservation was eliminated from further consideration as an alternative to replace water supplies lost as a result of changes to operation of Roosevelt.

### ***3.6.6.3 Recharge of Water That Cannot be Stored at Roosevelt***

The recharge of water that would otherwise be stored at Roosevelt is limited by legal, institutional, and practical constraints (see RHCP for further discussion). First, Arizona



law limits the storage of stored water underground. A new appropriation or a change in water right may be required to store water in a new location. Other water users with water rights to the Salt and Verde rivers would be entitled to protest new applications for appropriations or changes to water rights. Additionally, state law limits the long-term underground storage of water if its use is based on a decreed or appropriative water right. Such water must be recovered in the same calendar year in which it was recharged.

Second, under the SRP Articles of Incorporation and Federal reclamation law, water rights appurtenant to Salt River Project lands cannot be used outside of the boundaries of the Project unless exchanged for another water supply (see RHCP, Appendix 2; see also Salt River Reservoir District area on Figure 4 for the boundaries of the project). Thus, although it might be physically possible to recharge this water outside of the Project boundaries, the water would have to be brought back into SRP when it was recovered. This limitation restricts the location of recharge to an area near the SRP boundaries and greatly increases the costs of any such recharge project.

Third, there is a similar restriction in the location of recharge due to the fact that SRP facilities would have to be used to convey the water to the recharge site. This effectively limits the location of recharge sites to the Salt River between Granite Reef Dam and the confluence with the Gila, or the lower reaches of the Agua Fria or New rivers.<sup>37</sup>

Fourth, there are limits to the maximum rate and total amount of water that could be recharged and recovered. Because SRP facilities would need to be used to convey the recharge water, and those facilities have limited extra capacity over and above the space needed to deliver water for other uses, the rate of transport to a recharge facility would typically be limited to flow of a few hundred cfs (compared to the inflow to Roosevelt during peak storage periods, which is thousands to tens of thousands of cfs). In terms of the recovery of water that is recharged, SRP utilizes its own production wells to withdraw previously recharged water as surface water. During a severe drought, the time that recharged water would need to be recovered, nearly every SRP well is being used to pump ground water to augment releases of water from the dams to meet water demands. Thus, large-scale recovery of recharged water would require that SRP's ground water pumping capacity be greatly increased at substantial cost. The capital, operation, and maintenance cost for new wells is estimated at \$220/AF/yr).

SRP's capacity in the Granite Reef Underground Storage Project (GRUSP), an existing recharge facility located near the Salt River on the Salt River Pima-Maricopa Indian Reservation, is about 25,000 AF/yr or equivalent to about 35 cfs. GRUSP is actually permitted for 200,000 AF/year but it has never been able to approach that amount because the underground mound of water created by recharge encroaches on a nearby landfill. Modification and expansion of this facility potentially could increase the

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<sup>37</sup> The channel of the Salt River could be used to transport water for recharge but losses would be high and those losses would not count as "recharged water" under Arizona law (A.R.S. § 45-651 et seq.). Moreover, there are relatively few locations for recharge along the Salt River due to urbanization, flood control facilities, new recreation facilities (e.g., Rio Salado), and relatively high ground water tables. The same issue with high ground water levels occurs along the Gila River downstream of the confluence with the Salt.

capacity by as much as an additional 125,000 AF/yr (170 cfs) up to the full permitted capacity of 200,000 AF/yr; however, this would depend on additional infiltration basins being constructed as far to the south and east of the landfill as possible to allow the infiltrating water time to spread down and away from the landfill. It would also depend on the acceptability of such modifications and expansions to the Salt River Pima-Maricopa Indian Community. Seeking Community approval and obtaining all of the necessary permits would take several years or more (Lluria, pers. comm. 2002). SRP's share of the full capacity at GRUSP would be about 68,000 AF/yr (about 93 cfs). SRP plans to develop another recharge facility along the Agua Fria River channel that would eventually have a capacity of 100,000 AF/yr (about 140 cfs) after a period of approximately seven years following construction (Id.). SRP is also investigating the possibility of recharging up to 10,000 to 15,000 AF/yr (about 14 to 20 cfs) with wells (Id.). If feasible and fully implemented, the combined capacity of all of the recharge facilities described above would total about 300,000 AF/yr but the maximum rate of recharge would be about 400 cfs, which is significantly less than the thousands to tens of thousands of cfs that Roosevelt stores during peak periods of inflow.

In summary, recharge of water that could otherwise be stored at Roosevelt is severely limited by legal, institutional and practical constraints:

- Arizona law would have to be changed to allow long-term underground storage of water, and other water users could object to a new appropriation or a change in water right.
- Additional recharge locations, rate of recharge, and total capacity are limited.
- Available conveyance capacity between Granite Reef Dam and potential recharge sites is one to two orders of magnitude less than Roosevelt inflows to be stored.
- The cost to recharge and recover the water would be about \$400/AF per year or more.

As a result of these limitations, this alternative was eliminated from further consideration.

#### ***3.6.6.4 Use of CAP Water***

Central Arizona Project (CAP) water is a portion of Arizona's entitlement to Colorado River water and is delivered from the Colorado River to the Phoenix AMA via the CAP canal. Arizona's entitlement to Colorado River water is governed by the "Law of the River," a complex set of Federal laws, interstate compacts, treaties, and U.S. Supreme Court decisions. Although CAP water is surface water for limited purposes under state law (A.R.S. § 45-101), the right to use CAP water is governed by Federal law.

In 1983, the United States Secretary of the Interior issued a decision allocating CAP water among Arizona water users (48 FR 12446, March 24, 1983). The Secretary allocated 309,828 AF for Indian Tribes' uses, 638,823 AF for Municipal and Industrial ("M&I") use, and the remainder for non-Indian agricultural use. Indian Tribes and M&I water providers share a first priority to CAP water in shortage years. In order to be eligible for actual delivery of CAP water, each non-Federal entity receiving an allocation was required to sign a 50-year subcontract. Subcontracts were signed for all but 65,647

AF of the M&I water allocated. On January 20, 2000, ADWR recommended that the Secretary reallocate the remaining M&I water to certain municipal water providers. This reallocation would make small amounts of additional CAP water available to some of the cities that receive water from SRP. The Secretary did not act on ADWR's recommendation, and issued a June 2000 draft environmental impact statement (EIS) proposing several alternatives that reallocate the remaining CAP M&I water to Indian Tribes (65 FR 39177, June 23, 2000). As discussed in the draft EIS on CAP reallocations, various CAP allocation options for Indian, M&I, and non-Indian agricultural water supplies are possible in the future. However, under each of those alternatives, the CAP supplies are fully utilized by those users (Reclamation 2000). Because all of the CAP water has been or is being allocated for Indian, M&I, and agricultural use, CAP water cannot comprise a replacement water supply for lost Salt and Verde River water. Other Colorado River water is fully allocated to existing water users and other states (65 FR 48532, August 8, 2000; Boulder Canyon Project Act, 45 Stat. 1057 (1928); Upper Colorado River Basin Compact, October 11, 1948; Arizona v. California, 373 U.S. 546 (1963); Colorado River Basin Project Act, 82 Stat. 885 (1968)). Thus, the only additional Colorado River water available is excess CAP water, which would provide only a temporary and not a long-term water supply.

Excess CAP water is water that has not been scheduled for delivery pursuant to a long-term contract or subcontract and is available for delivery in some years. Excess CAP water may include surplus Colorado River water. Surplus water is available on the Colorado River system when the Secretary of the Interior declares surplus conditions, meaning more than 7,500,000 AF of water is available to meet consumptive use demands in the Lower Basin states.<sup>38</sup> While excess CAP water is currently available, quantities will continue to diminish as subcontractors and Indian tribes take more and more of their allocations. Likewise, increased use of Colorado River water through development in the Upper Basin states and reductions in supplies due to fluctuations in precipitation and runoff will also reduce the amount of excess CAP water available. In addition, both the Arizona Water Banking Authority and the Central Arizona Groundwater Replenishment District plan to store much of the available excess CAP water underground to firm up deliveries to their members in years of Colorado River shortages (ADWR 1998; CAGRD 2002).

Excess CAP water will not be available in the future, and, therefore, is a viable partial replacement water supply for water lost from reduced storage capacity at Roosevelt only if it can be stored underground for future use. However, there are many obstacles to storing excess CAP water underground. First, the delivery of excess CAP water is dependent upon sufficient capacity in the CAP canal to move water from the Colorado River to the Phoenix AMA. Excess CAP water deliveries have the lowest priority for canal capacity behind deliveries for M&I, Indian, and non-Indian agricultural uses pursuant to long-term contracts.<sup>39</sup> Second, the few potential recharge sites in the Phoenix

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<sup>38</sup> Criteria for coordinated long-range operation of Colorado River reservoirs pursuant to the Colorado River Basin Project Act (1970).

<sup>39</sup> See Excess Water Contract for CAP M&I Water.

AMA are limited by their cost, storage capacity, infiltration rates, ground water quality, proximity to the CAP canal, effects of mounding, impacts on surrounding lands and wells, and use by other entities to recharge other supplies.<sup>40</sup> Third, constructing the infrastructure necessary to transport water from the CAP canal to new recharge sites and the acquisition of rights-of-way for those facilities would be expensive if feasible. Fourth, existing water delivery infrastructure and recharge sites have additional limitations (see previous section). For example, CAP water may be moved into SRP's delivery system through the CAP interconnection facility at Granite Reef Dam for recharge at the Granite Reef Underground Storage Project (GRUSP) site. However, the ability to move water is constrained by the size of the interconnection facility and by capacity restrictions in SRP's canals. Transportation of excess CAP water has a low priority and may be prohibited when canal capacity is needed for delivery of project water, deliveries to Indian communities, and other SRP contractual commitments. Finally the cost to develop additional recharge and recovery facilities is an obstacle to reliance on excess CAP water to replace Roosevelt supplies (see previous section for costs).

In summary, CAP water is not a viable replacement source for water supplied from Roosevelt for the following reasons:

- Cap allocations are fully committed for existing and future Indian, M&I, and agricultural uses.
- Excess CAP water is not reliable, will diminish over time, and is being used to meet other demands in Arizona.
- Additional recharge locations and capacity are limited.
- The cost to purchase, convey, recharge, and recover excess CAP water would be greater than \$450/AF per year.

For these reasons, this alternative was eliminated from further consideration.

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<sup>40</sup> The constraints for recharge, recover, and distribution of excess CAP water are the same as those for effluent use discussed below.

### **3.6.6.5 Use of Effluent**

Effluent is the only water supply that is increasing in the Phoenix AMA.<sup>41</sup> While a substantial quantity of effluent is produced in the AMA, Valley cities already rely on much of this effluent to meet current and future water demands. Existing state law does not allow the direct use of effluent as drinking water. Thus, wastewater treatment plants and distribution systems in the Phoenix AMA are not designed for the production of potable effluent. As discussed below, increased reuse of non-potable effluent is limited in quantity and is expensive to implement.

One alternative is effluent reuse from local water reclamation facilities. However, this option is not a feasible long-term replacement water supply alternative for several reasons. Each of the cities potentially impacted by reductions in Salt and Verde River water supplies under the reservoir operation alternatives utilize local water reclamation facilities to some degree. Nearly all of the effluent produced at local reclamation facilities is already put to beneficial uses and carries with it a long-term commitment to those uses. Water potentially available from future local reclamation facilities, or from expansions of existing local reclamation facilities, is already committed to future water demands within the cities' water service areas. In addition, for the cities that own capacity in the regional 91<sup>st</sup> Avenue Wastewater Treatment Plant ("91<sup>st</sup> Avenue plant") west of Phoenix on the Salt River, constructing additional local reclamation capacity for local reuse would also come at the expense of reducing a like volume of wastewater treated at the 91<sup>st</sup> Avenue plant. For these cities, any additional local opportunities to reuse reclaimed water as a replacement supply would reduce the amount of replacement water available to them through the Agua Fria effluent recharge project described in Section 3.9.2.1. Furthermore, per unit costs for local effluent production would greatly exceed per unit costs at the 91<sup>st</sup> Avenue plant.

The 91st Avenue plant produces most of the available effluent in the Salt River Valley. The Cities of Phoenix, Glendale, Mesa, Scottsdale, and Tempe own the plant. However, much of the effluent produced by the 91st Avenue plant is already contractually committed to industrial and irrigation uses downstream of the plant. There is no infrastructure in place to transport the remaining effluent back upstream to the five cities' service areas where it could be reused. The costs for permitting and constructing the necessary infrastructure are high, and the effluent provided would serve only as a partial replacement water supply for the five cities that share the plant. Also, reducing flow downstream of the 91<sup>st</sup> Avenue plant may adversely affect endangered Yuma clapper rails that are present in the area.

Storing the effluent underground is expensive and has numerous issues. Suitable recharge locations near the 91<sup>st</sup> Avenue plant are limited. Many areas near the 91st Avenue plant cannot meet regulatory recharge site requirements due to the presence of landfills or water logging. The only suitable recharge sites are located at a distance from

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<sup>41</sup> In 1989, the Arizona Supreme Court held that effluent is neither ground water nor surface water, but a third type of water that belongs to the entity that generates it by treating wastewater. *Arizona Public Service Co. v. Long*, 160 Ariz. 429, 773 P.2d 988. Effluent is now codified as a third type of water by statute. A.R.S. § 45-101.

the 91<sup>st</sup> Avenue plant where effluent is produced. Costs exceeding \$57 million per year would be incurred in acquiring recharge sites, transporting the effluent to the sites, obtaining the necessary permits to recharge the effluent, recovering the water, and transporting it to the location of reuse. The costs of this alternative are used in the analysis of impacts in Chapter 4.

Despite the constraints, additional reuse of effluent is the most viable replacement source of water for reservoir operation alternatives that result in less surface water being supplied by SRP.

#### ***3.6.6.6 Acquisition of Water from Other Sources or Water Users***

In addition to the potential water sources described above, other options were researched. However, there are few other sources of water available and the quantity available from most of these sources would be limited. Three potential alternatives were identified from published documents and public comments during scoping: 1) develop new supplies of surface water in central Arizona; 2) purchase water rights from other water users; or 3) import water from distant sources such as the Colorado River or ground water underlying remote basins in western Arizona. As discussed below, these options do not appear to be economically feasible and each would face major legal and political hurdles to implementation.

Development of additional surface water supplies cannot provide a replacement water source for Salt and Verde River water that would be lost if SRP's reservoir operations are changed. Except for infrequent flood flows, surface water in Arizona is fully appropriated (USGS 1985, p. 145). Infrequent flood flows could provide a reliable water supply only if they could be stored underground for later use or stored in a new reservoir. State law, however, limits the long-term underground storage of water that is derived from a decreed or appropriative water right. Such water must normally be recovered in the same calendar year in which it was stored (A.R.S. 45-851.01). In addition, it would probably not be possible to acquire the necessary permits to construct new surface water storage reservoirs to store flood flows.

A limited amount of water is available for lease or purchase from other water users in central Arizona. Except for CAP water, most of that water is from nonrenewable ground water sources. Moreover, most, if not all, of the CAP and other surface water sources in the Phoenix area are already destined to satisfy municipal demand as urbanization rapidly occurs in the metropolitan area (ADWR 1994). Thus, lease or purchase of renewable water supplies would not replace losses of water from Roosevelt but would simply redistribute the available water.

Importing additional water supplies from either the Colorado River or distant ground water basins would be akin to constructing a second, smaller CAP system. Even if such a system were built to only deliver 5 to 10 percent of the CAP supply (about 75,000 to 150,000 AF/year), the cost would be hundreds of millions of dollars. Moreover, and perhaps more importantly with respect to the listed species issue at Roosevelt, such a project likely would have large environmental impacts resulting from withdrawing water from a distant source and constructing a system over many miles. These impacts would

likely negatively impact listed species and other wildlife, and have major socioeconomic effects.

For the reasons described above, the alternative of acquiring water from other sources or water users to replace reduced Roosevelt water supplies was eliminated from further consideration.

### **3.6.7 Measures to Minimize or Mitigate Power Supply Impacts Resulting from Changes in Reservoir Operations**

In addition to evaluating alternative water supply options to replace or augment storage in Roosevelt, several alternative measures were considered for replacing power supplied by water stored in Roosevelt. Within SRP's service territory, electric customers have increased by more than 100,000 during the past 5 years.<sup>42</sup> Local generation is needed close to the location of power demands in the Southeast Valley (Chandler, Gilbert, and Mesa areas) and must be integrated into the current system in order to meet power reliability needs. Hydropower produced by Roosevelt and the lower Salt River dams currently provides a portion of this local generation. Although the annual power generation from water stored at Roosevelt varies in relation to water supply, the long-term minimum projected generation is relied upon as firm capacity for planning purposes. Reduced storage at Roosevelt would decrease the firm capacity available to SRP and require replacement of the resource. The alternative measures to replace Roosevelt generation that would be lost under some reservoir operation alternatives are discussed below.

#### **3.6.7.1 *Construct New Transmission***

Losing hydrogeneration capacity from reduced storage at Roosevelt would exacerbate the current transmission constraint problems of importing power into the Southeast Valley. If continued operation of Roosevelt is curtailed, transmission upgrades and/or new generating facilities may be required to bring additional power to the customer load center in the Southeast Valley. Any new generation would need to be integrated into the current system to meet the Southeast Valley's power reliability needs. When the energy source is closer to customers, electric system reliability is increased and the need for new transmission facilities to and through the Southeast Valley is decreased. Because Roosevelt feeds into the Southeast Valley, reduction of its generation capacity would worsen the transmission situation. It may either require that new transmission be built into the Southeast Valley or additional local generation be constructed (discussed below).

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<sup>42</sup> Information for this section was developed from Section 2.1 of the Kyrene Expansion Project Environmental Assessment (ENSR 2001) and the Santan Expansion Project Newsletter (SRP 2000).

### ***3.6.7.2 Purchase Replacement Power***

To replace hydrogeneration capacity from reduced storage at Roosevelt, SRP could purchase power from the market. Purchased power can be at a fixed price, indexed or priced with a maximum and minimum range. Depending on the type of purchase, this would subject SRP and its customers to greater risks associated with fuel and energy price volatility. Assuming that power could be purchased for a reasonable cost, transmission constraints could make it difficult for SRP to deliver that power to its customers. Operating its own power generating plant at Roosevelt allows SRP to control the costs of power generation, and thus avoid the price volatility associated with purchasing energy from other suppliers. Continued full operation at Roosevelt would ultimately result in a more cost-effective and reliable source of electricity for SRP retail customers. Also, replacing Roosevelt generation with market purchases from a thermal unit would contribute to increasing emissions levels. Despite the issues associated with this option, purchase of power is the likely replacement for hydropower generation lost at Roosevelt under the No Permit and Re-operation alternatives.

### ***3.6.7.3 Construct New Power Generation Capacity***

If new transmission were not built to deliver power to the Southeast Valley, then new local generation may be required to replace Roosevelt's service to the Southeast Valley area. New generation would be needed close to this load center in order to meet power reliability needs. To help meet the requirement for local generation, SRP has recently begun expansion at two existing natural gas plants in the Southeast Valley. It would be very difficult to site additional new generation in the Southeast Valley largely because a new power plant would probably not be permitted in the Phoenix air quality non-attainment area.<sup>43</sup> Full operation of Roosevelt would continue to provide a local generation source with no emissions. Again, replacing that energy with a thermal unit or market purchases from a thermal unit would contribute to increasing emissions levels.

### ***3.6.7.4 Utilize Renewable Energy***

While SRP includes a variety of renewable energy projects in its balanced approach to meeting customer demand, these technologies are primarily in the developmental stages. Expanding these programs using existing technology for the generation of electricity through renewable sources is not currently a cost-effective alternative.

### ***3.6.7.5 Increase Energy Conservation***

SRP has developed several energy conservation or demand-side management programs that have proven successful and beneficial in conserving energy. As an example, SRP has nearly 120,000 residential customers enrolled in the "Time-of-Use" program which uses price signals to encourage customers to use the majority of their electricity during off-peak hours when demand and energy costs are lower. In addition to the residential Time-of-Use program, SRP has actively promoted commercial Time-of-Use programs, voluntary interruptible load tariffs, and the country's largest pre-paid

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<sup>43</sup> The Phoenix metropolitan area is currently designated as a non-attainment area because carbon monoxide, particulate matter (PM<sub>10</sub>), and ozone exceed National Ambient Air Quality Standards (ENSR 2001, p. 3-1).



metering program, which has a demonstrated reduction in usage of over 10 percent. SRP encourages conservation in both residential and commercial publications and continues to promote reduced consumption as a viable way to meet demand requirements. However, because full implementation of demand management programs is already built into SRP's power generation and transmission planning, additional conservation efforts would not offset the loss of power generation at Roosevelt.

### **3.7 Environmentally Preferred Alternative**

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969, which is guided by the Council of Environmental Quality (CEQ Section 1505.2[b]). The CEQ provides direction that the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural and natural resources." As expressed in NEPA's Section 101 (42 USC § 4331), "it is the continuing responsibility of the Federal Government to:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

The environmentally preferred alternative for Roosevelt Lake was evaluated based on these national environmental policy goals. A discussion of how each alternative meets these goals follows.

#### **3.7.1 Alternative 1— No Action by FWS**

This alternative provides for the short-term protection of natural resources, including threatened, endangered, and candidate species by maintaining existing levels of habitat at Roosevelt Lake. However, long-term maintenance of existing riparian habitat is unlikely with a lower reservoir level. Alternative 1 would maintain a safe environment, although there would be some degradation of the aesthetic quality at Roosevelt and at the Verde reservoirs with a lower water level and greater exposure of unvegetated slopes around the reservoir perimeter. Natural and cultural resources would be maintained with a slight increase for disturbance of cultural resources exposed by lower lake water levels.

Recreation opportunities would be diminished at Roosevelt with a 30 percent reduction in reservoir surface area. This alternative would reduce available water supplies and power for Phoenix metropolitan water users, which may result in higher water and electricity costs for many Arizona residents and businesses. Alternative 1 would result in a decreased use of renewable resources by reducing water storage and hydropower production. Development of replacement water sources may be detrimental to the environment and may require increased use of declining aquifers. Replacement energy sources would not be as clean as hydropower. While this alternative would provide for the near-term protection of threatened and endangered species, it does not fully meet the provisions of the environmental policy goals.

### **3.7.2 Alternative 2—Full Operation of Roosevelt (Proposed Action)**

Alternative 2 could result in a periodic loss of habitat for threatened, endangered, and candidate species from inundation or drying of riparian habitat. Over the long term, suitable habitat would be available on average, but fluctuations in reservoir levels would result in periodic decreases in species productivity. Proposed replacement of affected habitat at a 3:1 ratio would provide for the long-term protection and availability of habitat for federally listed species. This alternative would maintain a safe environment and would allow for continued public use of existing recreation capacity. The quality of the aesthetic environment would be maintained and no effects to cultural resources are predicted. Available water and power supplies to support the residents and businesses in the Phoenix area would be maintained, with no impact to the local and regional economy. The use of renewable resources would be optimized by conserving water and generating hydropower.

### **3.7.3 Alternative 3—Re-operation of Roosevelt**

Alternative 3 provides for an intermediate level of protection for threatened, endangered, and candidate wildlife species by limiting the maximum reservoir elevation. The long-term availability of habitat would vary with lake levels and would fall between Alternatives 1 and 3. Existing and additional habitat acquisition, management, and conservation would provide for a long-term source of available habitat. Scenic values at Roosevelt would be near current conditions and public safety maintained. Recreational opportunities would be slightly diminished with a smaller reservoir, and cultural resources could be subject vandalism or disturbance. The water and power supply available to the Phoenix area would be substantially reduced requiring additional investment in developing new water supplies with adverse environmental consequences. Indirect impacts to the local and regional economy from a loss in water supplies and electricity would affect residents and businesses.

### **3.7.4 The Environmentally Preferred Alternative**

Alternative 2, Full Operation, is the environmentally preferred alternative because it surpasses other alternatives in realizing the full range of environmental policy goals in Section 101 of the NEPA. Although Alternative 1 provides for the immediate protection

of threatened, endangered, and candidate species, it may not provide for the long-term habitat needs of those species. Short-term protection of habitat would result in adverse effects to other natural resources, recreation, the local and regional economy, and use of renewable resources. Alternative 3 provides an intermediate level of resources protection, but also has impacts similar to Alternative 1. Alternative 2 provides for a high level of resource protection by acquiring and protecting in perpetuity suitable replacement habitat for species affected by periodic habitat inundation at Roosevelt. This alternative also provides the widest range of neutral and beneficial uses of the environment, maintains an environment that supports a diversity and variety of individual choices, and provides the best overall balance in integrating resource protection with permitting a high standard of living for the local population.

### 3.8 Summary

Table 9 provides a summary comparing the potential effects of the three alternatives. Chapter 4—Environmental Consequences provides additional description on the impact of these actions for each resource.

**Table 9. Summary comparison of alternatives and impacts.**

| Impact Topic      | Alternative 1<br>No Action by FWS  | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation  |
|-------------------|--|--|--|
| <b>VEGETATION</b> | Long-term shift from riparian vegetation to desert scrub above the new maximum reservoir elevation. Conversion of vegetation at Tonto Creek and Salt River inflows to riverine riparian. | Fluctuating plant species composition between riparian, open ground, or desert vegetation in the lakebed. No change in quantity or quality of existing upland vegetation. Conversion of up to 75 acres of agricultural land or upland vegetation to riparian vegetation and minor disturbance for irrigation canal and road construction at Roosevelt mitigation site. | Long-term shift from riparian to scrub at upper elevations. Conversion of up to 75 acres of agricultural land or upland vegetation to riparian vegetation and minor disturbance for irrigation canal and road construction at Roosevelt mitigation site. |
| <b>WETLANDS</b>   | Fewer wetlands on average with lower reservoir level.  | No net change in wetland area. Wetlands would vary annually subject to reservoir levels.   | Slightly less wetland area on average with lower reservoir level.  |

| Impact Topic                                  | Alternative 1<br>No Action by FWS  | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)  | Alternative 3<br>Re-operation   |
|---|--|---|---|
| <b>WILDLIFE AND<br/>AQUATIC<br/>RESOURCES</b> | Wildlife favoring upland habitat would benefit; species favoring riparian habitat would be adversely affected in the long term. Reduced shallow-water fish habitat. An increase in spills may affect riparian and aquatic habitat on the Salt River due to turbidity and scouring. A decrease in annual maximum spills on the Verde may change riparian and aquatic habitat composition, although the effects are difficult to determine. Lower Verde Reservoir lake levels may reduce the quality of aquatic habitat. | No effect on upland habitat. Effects to riparian wildlife and aquatic species would vary annually. Provides the greatest amount of habitat for both deep and shallow water fisheries. At the Roosevelt mitigation site, upland species would lose habitat and riparian species would gain habitat. Habitat acquisition and management, and additional management measures would benefit wildlife and aquatic resources at mitigation sites. | Slight benefit to upland wildlife. A long-term decrease in riparian habitat would impact riparian-dependent species. Less habitat for deep and shallow water fisheries. At the Roosevelt mitigation site, upland species would lose habitat and riparian species would gain habitat. Additional Salt River spills may have minor effect on downstream riparian habitat. Lower Verde Reservoir lake levels may reduce the quality of aquatic habitat. Habitat acquisition and management, and additional management measures would benefit wildlife and aquatic resources at mitigation sites. |

| Impact Topic  | Alternative 1<br>No Action by FWS  | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation  |
|---|--|--|--|
| <b>THREATENED,<br/>ENDANGERED,<br/>AND RARE<br/>SPECIES</b> | <p>Flycatcher—No effect in the short-term, but a long-term reduction of habitat is likely. A decrease in flycatcher productivity over the long-term. No conservation measures would be implemented.</p> <p>Yuma Clapper Rail—No reduction in habitat or productivity.</p> <p>Bald Eagle—Pinto and Tonto nest trees would not be lost from inundation, but loss of supporting hydrology may affect nest trees. Prey availability of fish would decrease, but waterfowl may be more available. Interspecific competition between breeding areas may increase. Long-term decrease in bald eagle productivity. No new conservation measures.</p> <p>Cuckoos—No effect on existing cuckoo habitat, but long-term reduction of habitat. Minor long-term effects in productivity.</p> <p>Sensitive Species—No effect.</p> | <p>Flycatcher—Anticipated periodic losses of up to 750 acres of occupied habitat due to inundation or desiccation. On average 400 acres of habitat would be available, but a decrease in productivity is likely with periodic losses of habitat. Multiple conservation measures, including 3:1 mitigation for impacted habitat would offset adverse effects.</p> <p>Yuma Clapper Rail—Anticipated periodic losses of up to 5 acres of occupied habitat due to inundation, with a decrease in productivity. Mitigation for impacted habitat would offset adverse effects.</p> <p>Bald Eagle—Potential inundation of Pinto and Tonto nest sites. Prey availability of fish and waterfowl would be maintained. Interspecific competition between breeding areas is less likely with larger reservoir. Additional conservation measures would reduce potential effects.</p> <p>Cuckoo—Periodic inundation of about 313 acres of habitat anticipated. Over the long term, habitat and productivity would fluctuate annually. Conservation measures for flycatchers would benefit cuckoos.</p> <p>Sensitive Species—No effect.</p> | <p>Flycatcher—Anticipated periodic losses of up to 250 acres of occupied habitat due to inundation or desiccation. A decrease in productivity is possible with a reduction in existing habitat. Multiple conservation measures similar to Alternative 2 would be implemented.</p> <p>Yuma Clapper Rail—Same impacts and mitigation as Alternative 2.</p> <p>Bald eagle—Pinto and Tonto nest sites would not be inundated. Foraging opportunities similar to current conditions. Interspecific competition between breeding areas would be slightly greater than Alternative 2 and bald eagle productivity also would be less. Conservation measures similar to Alternative 2.</p> <p>Cuckoo—Periodic inundation of about 60 acres of habitat anticipated. Over the long-term habitat and productivity would fluctuate annually. Conservation measures for flycatchers would benefit cuckoos.</p> <p>Sensitive Species—No effect.</p> |

| Impact Topic   | Alternative 1<br>No Action by FWS  | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation   |
|--|--|--|---|
| <b>WATER RESOURCES, FLOOD CONTROL, AND WATER QUALITY</b> | Reduction in local and regional water supply, including an annual average decrease in SRP deliveries of 82,000 AF, and City deliveries of 49,000 AF due to a loss in NCS. SRP ground water pumping would need to increase 66,000 AF/year. Cities would not be able to use additional ground water. Salt and Verde reservoir spills would increase 419,000 AF/year. Additional spills would slightly dilute downstream effluent, but existing effluent discharge already meets water quality standards. Increased flood flows would increase turbidity and sedimentation. | No change in storage capacity or local and regional water supply; no changes in flood control or water quality.  | Water deliveries to SRP would decrease on average by 25,000 AF and City deliveries would decrease by 49,000 AF. SRP ground water pumping would need to increase 14,000 AF/year and the Cities would have to find a replacement water supply other than ground water. Flood capacity would remain, but spills at Granite Reef would increase 86,000 AF/year. Additional spills would slightly dilute downstream effluent, but existing effluent discharge already meets water quality standards. Increased flood flows would increase turbidity and sedimentation. |
| <b>VISUAL RESOURCES</b>                                  | Less surface water area and greater exposed shoreline. No impact to VQO. Visual quality would be reduced slightly at Horseshoe and Bartlett reservoirs with seasonal changes in water levels.  | No change to visual quality. No impact to VQO. Acquisition, protection, and creation of riparian habitat at mitigation sites would have a long-term positive impact. | Visual quality would be similar to existing conditions. No impact to VQO. Visual quality at Bartlett and Horseshoe reservoirs would be reduced slightly during periods of low runoff. Acquisition, protection, and creation of riparian habitat at mitigation sites would have a long-term positive impact.   |
| <b>CULTURAL RESOURCES</b>                                | Previously inundated cultural resources sites subject to degradation and vandalism.  | No change to cultural resources impacts at reservoir. No adverse impacts at Roosevelt or other mitigation sites are anticipated.                                     | Previously inundated cultural resources sites subject to degradation and vandalism.   |

| <b>Impact Topic</b> | <b>Alternative 1<br/>No Action by FWS</b>  | <b>Alternative 2<br/>Full Operation of<br/>Roosevelt<br/>(Proposed Action)</b>   | <b>Alternative 3<br/>Re-operation</b>  |
|---------------------|--|--|--|
| <b>LAND USE</b>     | No direct change in land use.  | No change in land use patterns at Roosevelt. Acquisition of land at mitigation sites would preserve land in a natural condition, but may eliminate grazing, agriculture or other land practices. | Similar to Alternative 2.  |
| <b>RECREATION</b>   | A 30% reduction in reservoir area would reduce boating, fishing, and recreation opportunities. Many of the boat ramps would no longer extend into the lake, which could result in crowding at remaining ramps. Recent campground improvements may be less attractive because the lake would be farther away. | Recreation use would vary with water levels similar to current conditions.   | A 10% reduction in reservoir area surface area would reduce boating, fishing, and recreation opportunities. Impacts would fall between Alternatives 1 and 2. |

| Impact Topic          | Alternative 1<br>No Action by FWS   | Alternative 2<br>Full Operation of<br>Roosevelt<br>(Proposed Action)   | Alternative 3<br>Re-operation   |
|-----------------------|---|--|---|
| <b>SOCIOECONOMICS</b> | <p>Water Supply—SRP’s cost to replace lost water supplies would be about \$72 million per year and the Cities cost about \$43 million per year. The present value of these impacts over 50 years is \$1.8 billion if sources can be found. Local residents and businesses would be affected by increased water costs.</p> <p>Hydropower—Lost power production would have a value of about \$2.6 million/year or \$41 million over 50 years. Consumer cost for power may increase.</p> <p>Recreation— Direct loss in revenue about \$6 million/year or \$96 million over 50 years. Recreation related businesses would be impacted.</p> <p>Environmental Justice—Minority and low income populations would not be disproportionately affected.</p> | <p>Water Supply—No impact to water supply costs.</p> <p>Hydropower—No change in hydropower production.</p> <p>Recreation—No change in recreation related economy.</p> <p>Environmental Justice—Minority and low income populations would not be disproportionately affected.</p> | <p>Water Supply—SRP’s cost to replace lost water supplies would be about \$21.5 million per year and the Cities cost about \$43 million per year. The present value of these impacts over 50 years is \$1 billion if sources can be found. Local residents and businesses would be impacted increased water supply costs.</p> <p>Hydropower—Lost power production would have a value of about \$1.3 million/year or \$25 million over 50 years. Consumer cost for power may increase.</p> <p>Recreation— Direct loss in revenue about \$2 million/year or \$32 million over 50 years. Recreation related businesses would be impacted.</p> <p>Environmental Justice—Minority and low income populations would not be disproportionately affected.</p> |





# **Chapter 4**

## **Affected Environment and Environmental Consequences**

### **4.1 Introduction**

This chapter includes a discussion of the affected environment, which provides information on existing conditions near Roosevelt Lake and areas potentially affected by alternative actions. Background information is provided for natural resources, cultural resources and socioeconomic resources. Following the Affected Environment section, the analysis of environmental consequences evaluates the potential impacts on threatened and endangered species, as well as on other resources, from implementation of the proposed RHCP and alternative actions.

Typically, in a NEPA analysis, baseline environmental conditions are defined by the No Action alternative and other alternatives are compared to existing conditions. However, for this project, the proposed action (Alternative 2) is the continued operation of Roosevelt and the No Permit or No Action alternative (Alternative 1) requires a modification in the operation of Roosevelt. Thus, for comparison purposes in the discussion of environmental consequences in this chapter, Alternative 2 (Full Operation) provides the baseline environmental conditions for comparing impacts with other alternatives.

### **4.2 Water Resources, Flood Control, and Water Quality**

#### **4.2.1 Affected Environment**

Available surface water and ground water resources are critical components of the SRP water supply. Existing water supplies in the arid climate of central Arizona are limited. The primary purpose of Roosevelt Dam since its authorization in 1903 has been to maximize the conservation of water—to store water in times of high runoff for later use, to reduce downstream flood hazard, and to generate power as the water is released for downstream uses. Roosevelt Dam is an integral part of the Salt River system of storage reservoirs that form a continuous chain of lakes approximately 60 miles long. Roosevelt provides flood control, municipal and irrigation water, and hydropower for central Arizona.

Roughly half of Arizona averages less than 10 inches of precipitation a year. However, mountain ranges in the upper Salt River basin above Roosevelt average up to 25 inches of precipitation a year. Precipitation at higher elevations in the Salt River basin is not always reflected in runoff at lower elevations if snowmelt proceeds slowly or if rains are relatively gentle and soils are unsaturated. However, high intensity rainfall,

rapid snowmelt, or a combination of both, almost invariably result in some level of flooding (Corps 1997). A large fraction of water in the SRP system is derived from melting snow from the White Mountains, which typically receive between 8 and 11 feet of snow annually. The mean annual precipitation and snowfall for the four climatological stations in the Salt River drainage area are shown in Table 10.

**Table 10. Annual precipitation in the upper Salt River watershed.**

| Climatological Station<br>(Arizona) | Mean Precipitation (inches)<br>(1941-1970) | Mean Snowfall (inches)<br>(1941-1970) |
|-------------------------------------|--|---------------------------------------|
| Alpine                              | 19.33                                      | 60.3                                  |
| McNary                              | 24.9                                       | 102.1                                 |
| Roosevelt 1 WNW                     | 14.15                                      | .5                                    |
| White River                         | 17.35                                      | 21.0                                  |

Source: Corps 1997.

#### **4.2.1.1 Surface Water**

Roosevelt lies within the Gila River basin, an irregular area of approximately 58,200 square miles extending from the Continental Divide in southwestern New Mexico to the Colorado River at Yuma, Arizona. It includes most of southern Arizona and constitutes a region of diverse topographical and climatological characteristics. The Salt River is the largest tributary of the Gila River and drains approximately 13,700 square miles within the central and eastern portions of Arizona. The Salt River is formed by the confluence of the Black and White rivers and drains the White Mountains and the Mogollon Rim in east-central Arizona. Other major streams that drain to the Salt River upstream of Roosevelt are Carrizo Creek, Cibecue Creek, Cherry Creek, and Pinal Creek, each of which drains an area of more than 200 square miles. The Verde River, which joins the Salt River downstream from Roosevelt, is the largest tributary of the Salt River and drains an area of approximately 6,620 square miles. Tonto Creek, which joins the Salt River at the dam site, is the Salt River's second largest tributary and drains an area of approximately 1,000 square miles. About 5,830 square miles of the Salt River watershed is located above Roosevelt.

Downstream of the Salt/Verde river confluence, water released from SRP reservoirs is diverted at the Granite Reef Diversion Dam for agricultural and municipal use. The Salt River below Granite Reef and downstream to 23<sup>rd</sup> Avenue is mostly dry except when there are flood flows and at Tempe Town Lake, which stores water year-round. Municipal wastewater is returned to the Salt River at the 23<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue wastewater treatment plants (WWTP). Some effluent is delivered directly from the WWTPs for irrigation use and the Palo Verde nuclear power plant. Unused effluent and irrigation tailwater is returned to the Salt and Gila rivers where it is diverted for use by three irrigation districts. Gillespie Dam is located about 40 miles downstream from the Salt/Gila river confluence (Reclamation 1996a). The perennial flow in this reach of the Gila River is a combination of gravel quarry pumpage, WWTP effluent, irrigation

tailwater, natural ground water discharge, and water from other miscellaneous sources (Reclamation 1996a).

#### **4.2.1.2 Ground Water**

Roosevelt lies within the Salt River and Tonto Creek ground water basins. Ground water<sup>44</sup> pumping of the Tonto Creek basin is limited because 97 percent of the area is National Forest land. Most wells are low-yield domestic and livestock wells. The two major aquifers within this basin receive most of their recharge by infiltration from Tonto Creek (Reclamation 1996a).

The upper Salt River ground water basin covers the remainder of the Roosevelt watershed. The Salt River basin depends primarily on short-term recharge; therefore, it is sensitive to drought and ground water pumping. Except for the Globe/Miami area, most wells are low-yield domestic and livestock wells. Ground water is the primary water supply source in the Globe/Miami area for both public water supply and industrial uses.

In March 1989, Reclamation initiated a well water level and quality monitoring program to document existing ground water conditions in the Roosevelt Lake Estates area near the southeast end of Roosevelt prior to raising Roosevelt Dam. This study was used to estimate potential effects of higher lake elevations upon the ground water used by residents. Observation wells indicated the depth to ground water ranged from about 2 feet to 74 feet below ground surface, with most of the readings falling between 30 and 40 feet below ground surface. None of the samples tested for water quality exceeded Federal drinking water standards for contaminants. Possible mixing of local ground water with Roosevelt water during flood events was not expected to affect the quality of residential ground water because of the similarities between the quality of lake water and ground water and the short period of flood storage.

Ground water in the Salt River Valley downstream of the Salt/Verde River confluence has experienced a long-term decline in water levels from an imbalance between recharge and pumpage. The primary source of ground water in the Phoenix Active Management Area (AMA) designated by ADWR is basin-fill sediments (ADWR 1999). Sources of ground water recharge include natural recharge from flood flows on the Salt River and in ephemeral streams and along mountain fronts, and incidental recharge from agricultural and urban irrigation, canals and artificial lakes. Ground water movement in the Salt River Valley has shifted from the Salt and Gila rivers toward five cones of depression created by ground water pumping for agricultural and municipal use.

#### **4.2.1.3 Flood Control**

Although the original Roosevelt Dam provided no dedicated flood control space, SRP has operated Roosevelt to provide incidental flood control by monitoring inflows and initiating spillway releases in anticipation of flood inflows. Modifications to the Roosevelt Dam in 1996 added: 1) flood control space to help reduce downstream flood damage; 2) flood surcharge space to protect the dam from overtopping; and 3) additional

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<sup>44</sup> As used in this EIS, “ground water” means underground water regardless of its status as appropriable or non-appropriable water under Arizona law.

water conservation space. Reclamation and the U.S. Army Corps of Engineers developed a Water Control Manual (Manual) to regulate flood flows. The overall objective of the Manual for the flood pool at Roosevelt is to minimize downstream flood damage along the Salt and Gila rivers, including the Salt River reservoir system, the metropolitan Phoenix area, and other downstream communities (Corps 1997). This is accomplished by minimizing peak discharges at the Salt/Verde River confluence during major flood events, including the standard project flood, through controlled releases from Roosevelt. In addition, the Manual is designed to maximize incidental production of hydropower during flood operations. The Roosevelt Dam power plant has a design discharge of 2,400 cfs and is one of eight units operated by SRP on the Salt River dams. Small releases that use SRP's hydrogeneration facilities on the Salt River during early stages of flood events or during events with low peak inflows of long duration contribute to this power production. The Manual also is designed to prevent the possibility of overtopping the dam during extremely large floods up to the magnitude of the probable maximum flood (PMF).

Currently the Manual calls for flood control water releases from Roosevelt only when reservoir capacity exceeds an elevation of 2,151 feet. Maximum reservoir releases vary with reservoir elevation. Under the Manual, releases from the reservoir increase incrementally (from 1,900 to 53,100 cfs) when Roosevelt is within the flood control pool (elevation 2,151 to 2,175 feet) (Corps 1997). The regulation of the dam above the flood control pool (elevation 2,175 feet) is limited to a maximum spillway release of 150,000 cfs. The Manual also attempts to limit the maximum flow at the confluence of the Salt and Verde rivers to 180,000 cfs at all times, except when the water surface elevation behind Modified Roosevelt Dam exceeds the top of the flood pool (2,175 feet).

Releases made into the mostly dry Salt River channel during floods in recent years have resulted in erosion and washouts at landfills located along the Salt River below Granite Reef. Steps have been taken to protect many of the landfills along the Salt River from future erosion. The Rio Salado and Tres Rios projects along the Salt River through Phoenix and downstream to the confluence of the Gila and Agua Fria rivers are being developed to alleviate flooding problems and restore a riparian ecosystem (FWS 1999).

#### ***4.2.1.4 Water Quality***

Water quality in the Salt River watershed is generally good (Reclamation 1996a). Much of the watershed above Roosevelt is undeveloped National Forest and Indian reservation lands. Saline springs located above Roosevelt are considered to be the principal source of dissolved salts found in the Salt River (Reclamation 1996a). Surface water contamination is present in several upstream Salt River tributaries including Pinal Creek, Miami Wash, and Blood Tanks Wash. These drainages have exhibited high metal concentrations, turbidity, low pH, and elevated total dissolved solids levels due to mining.

Several reaches of Tonto Creek above Roosevelt are listed on the Clean Water Act 303(d) list of impaired waters due to contamination. The headwaters of Tonto Creek and Christopher Creek have higher than allowable standards of nitrogen and phosphorus, which are a result of discharges from a State of Arizona fish hatchery and heavy summer recreation use (Garcia and Associates 2001). The mainstem of Tonto Creek between Rye

and Gun creeks has higher than allowable sediment loads, which are possibly associated with grazing and contribute to the background pollution in Tonto Creek.

## **4.2.2 Environmental Consequences**

The impact of reservoir operation alternatives on water supply is based on the reservoir operation modeling (SRPSIM) used in the RHCP (see Appendix 3 of the RHCP for a summary of the model and results). SRPSIM hydrologic model runs were made for each of the alternatives using inflows from the 1889 to 1994 period of record with the current reservoir system and demands. Potential water resource impacts for the Re-operation and No Permit alternatives were determined by the net change in water supply relative to current operating conditions under the Full Operation alternative.

A decrease in the storage capacity in Roosevelt for the No Permit and Re-operation alternatives would reduce the water supply available for SRP and irrigation and municipal water users. All water users entitled to SRP surface water deliveries would proportionately share in the loss of those supplies. Cities entitled to NCS water would bear the entire loss of those supplies under the No Permit or Re-operation alternatives because the additional storage capacity created by Modified Roosevelt could not be utilized.

### ***4.2.2.1 Effects of No Permit Alternative (Alternative 1)***

**Surface Water.** Under the No Permit alternative, water above elevation 2,095 feet would be released from Roosevelt by May 1. The total maximum surface area of the reservoir would decrease about 44 percent (to 13,000 acres) compared to current conditions under the Full Operation alternative (Table 11). Conservation storage capacity would decrease 56 percent from about 1.6 million AF to 702,000 AF, reducing the water available for municipal and agricultural uses. Total surface water deliveries to downstream users would decrease about 131,000 AF per year from current conditions on average (Table 12). This includes a reduction of about 82,000 AF/year in SRP deliveries and a reduction of about 49,000 AF/year in deliveries to the Cities from NCS space in Roosevelt. This may result in a permanent loss of the water right to store and utilize this water for both SRP and the Cities.

**Table 11. Comparison of Roosevelt maximum elevation, surface area, and storage capacities by alternative.**

| Roosevelt Characteristics               | Alternative 1<br>No Permit | Alternative 2<br>Full Operation | Alternative 3<br>Re-Operation |
|---|----------------------------|---------------------------------|-------------------------------|
| Maximum Reservoir Elevation (feet)      | 2,095                      | 2,151                           | 2,125                         |
| Reservoir Surface Area (acres)          | 13,000                     | 21,500                          | 17,000                        |
| Conservation Storage <sup>†</sup> (AF)  | 701,547                    | 1,609,134                       | 1,149,242                     |
| Flood Control Storage <sup>‡</sup> (AF) | 2,709,887                  | 1,802,300                       | 2,262,192                     |

<sup>†</sup>Storage capacity for water for delivery, except dead storage capacity of 17,400 AF.

<sup>‡</sup>Includes flood control storage and safety of dam flood surcharge pools. For Alternatives 1 and 3, reduced conservation storage becomes additional flood control storage. There is no change in existing flood control storage under for Alternative 2.

**Table 12. Comparison of average changes in surface water deliveries, ground water pumping, spills, and reservoir storage (1,000s of AF). <sup>†</sup>**

| Water Resource                                 | Alternative 2<br>Full Operation<br>Release above<br>Elevation 2,151<br>(Existing<br>Conditions) | Alternative 1<br>No Permit<br>Release above Elevation 2,095 |   | Alternative 3<br>Re-operation<br>Release above Elevation 2,125 |   |
|--|---|---|---|--|---|
|  |   | Water<br>Delivery,<br>Pumping,<br>Spill, Storage            | Net Change<br>Compared to<br>Existing<br>Conditions | Water<br>Delivery,<br>Pumping,<br>Spill, Storage               | Net Change<br>Compared to<br>Existing<br>Conditions |
| Surface Water Deliveries                       |   |   |   |  |   |
| SRP Deliveries <sup>‡</sup>                    | 948   | 867   | -82   | 924  | -25   |
| City NCS Deliveries                            | 49  | 0   | -49   | 0  | -49   |
| Total  | 997   | 867   | -131  | 924  | -74   |
| SRP Ground Water Pumping                       |   |   |   |  |   |
| Salt River Valley                              | 138   | 204   | +66   | 152  | +14   |
| Reservoir Spills                               |   |   |   |  |   |
| Salt River                                     | 134   | 284   | +150  | 228  | +94   |
| Verde River                                    | 128   | 135   | +8  | 120  | -8  |
| Total at Granite Reef                          | 262   | 419   | +158  | 348  | +86   |
| Reservoir Content — (Average for September 30) |   |   |   |  |   |
| Roosevelt                                      | 789   | 416   | -373  | 657  | -132  |
| Horseshoe                                      | 8   | <1  | -8  | 0  | -8  |
| Bartlett                                       | 104   | 81  | -24   | 79   | -26   |

<sup>†</sup>Based on SRPSIM model run for the years 1889-1994.

<sup>‡</sup>Includes all contract deliveries except NCS.

**Ground Water.** The estimated loss of surface water supply because of reduced reservoir storage could be partially offset by additional SRP ground water pumping (Table 12). However, the cities served by SRP cannot fully use this additional ground water because their Assured Water Supply (AWS) designations place strict annual limits on the amount of ground water that can be used by the cities in any year.<sup>45</sup> Ground water pumped by SRP and delivered to the cities is added to the amount of ground water pumped by the cities to determine compliance with these limitations. Therefore, the additional ground water pumped by SRP cannot serve as a replacement water supply for the cities.

The release of water above elevation 2,095 feet in Roosevelt would have a positive impact on ground water recharge along the river channel from the Granite Reef Diversion Dam to 23<sup>rd</sup> Avenue; however, recapture of this water through pumping is subject to limitations of withdrawals under the Groundwater Management Act.

**Flooding.** The No Permit alternative would result in a change in spills at Granite Reef during high runoff periods and flood events on the Salt and Verde rivers due to a reduction in storage capacity in Roosevelt and indirect effects on storage levels in other SRP reservoirs. On average, this alternative would require the release of an additional 158,000 AF/yr during flood events compared to the Full Operation alternative (Table 12). Only 5 percent (8,000 AF/year) of the additional spills would occur from Verde River reservoirs; the remainder would be from Roosevelt but maximum annual spills on the Verde would decrease 77,000 AF (Appendix 3 in the RHCP). The decrease in maximum Verde reservoir spills is because these reservoirs are drawn down to a greater extent to offset the loss of water storage in Roosevelt. Maximum annual discharges on the Salt River would increase 381,000 AF because of the need to lower reservoir levels below 2,095 feet.

The majority of spills would occur between December and April (Figure 10). Flood events are extremely variable both in timing and magnitude; thus, maximum annual spills vary widely from the average and may range from 0 to 3.5 million AF based on the modeled inflows. This range is approximately the same as the Full Operation alternative (0 to 3.2 million AF).

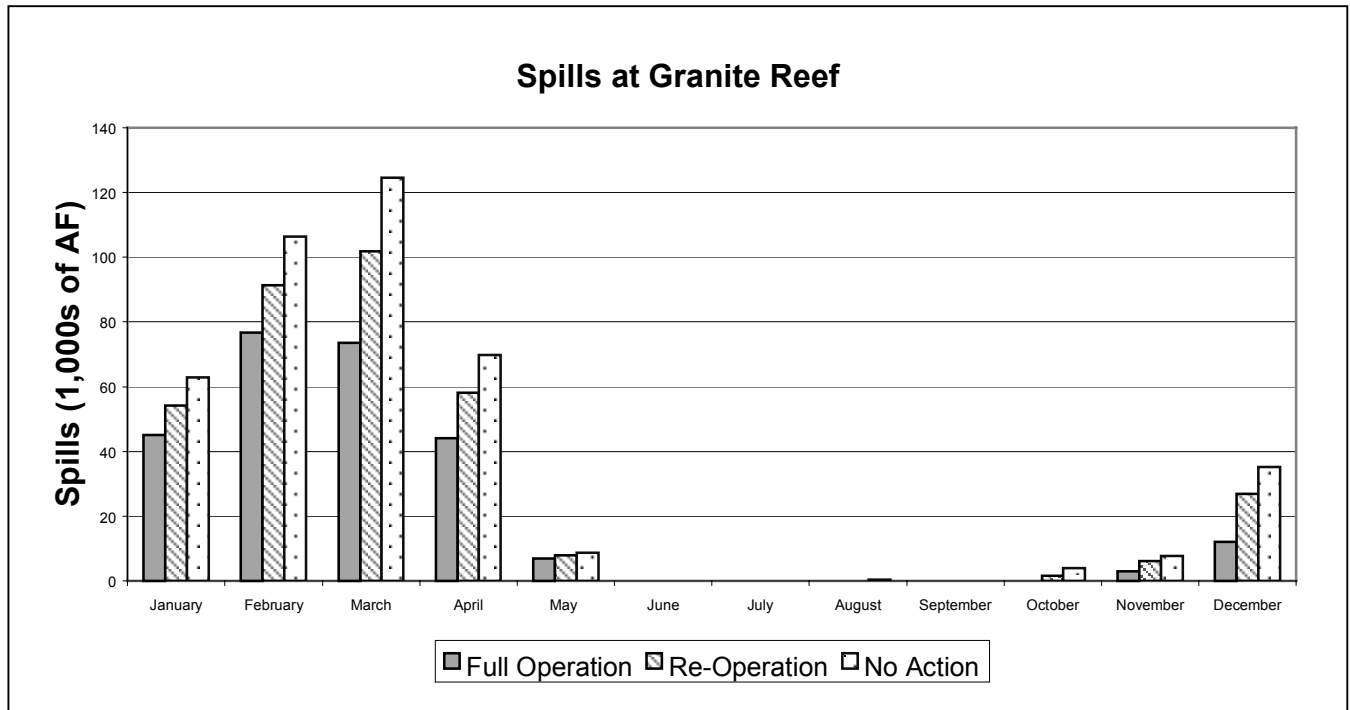
A reduction in the conservation storage space would increase flood storage capacity. However, the additional flood storage capacity is unlikely to be beneficial because modifications to Roosevelt in 1996 were designed to handle the probable maximum flood.

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<sup>45</sup> Under the Arizona Groundwater Management Act, annual ground water withdrawals by each city are limited to the phase-out ground water allowance and the annual incidental recharge component. The phase-out ground water allowance is a finite amount that will eventually go to zero for each city. The annual incidental recharge component is each city's "safe-yield" ground water withdrawal allowance, equivalent to the volume of incidental recharge returning to the aquifer each year within a city's service area (approximately 4 percent of each city's annual service area water use).



**Figure 10. Comparison of average monthly spills by alternative (AF) at Granite Reef.<sup>†</sup>**



<sup>†</sup> Averaged over the years 1889-1994.

Source: Data available at SRP.

**Water Quality.** Several potential changes in downstream water quality would occur under the No Permit alternative. Streamflow below Roosevelt would increase because storage capacity would be reduced. During flood events, the additional reservoir spills would have a slight to moderate impact on water quality by increasing the suspended sediment load. The additional water released from October to May on average would dilute existing effluent discharges below the 23<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue WWTPs. The dilution of treated effluent could have a slight beneficial effect on water quality for downstream users, although existing effluent discharges meet water quality standards. The periodic amount of wastewater dilution would vary depending on the timing and volume of flood events.

#### 4.2.2.2 *Effects of Full Operation Alternative (Alternative 2)*

**Surface Water.** There would be no impact on existing surface water supplies as a result of the Full Operation alternative. The Full Operation alternative constitutes the existing condition or baseline for evaluation of the impacts from the other reservoir operation alternatives. Roosevelt would maintain storage capacity of about 1.6 million AF (Table 11) at an elevation of 2,151 feet including 255,000 AF of NCS provided by previous dam modifications. The maximum reservoir surface area would remain at 21,500 acres. There would be no change in the current deliveries of surface water to SRP

or the cities, subject to normal variations in precipitation and runoff. There would be no loss of existing water rights.

Historically, up to 80 acres were irrigated from the Salt River in the vicinity of Rockhouse Farm (SWCA and SRP 1989). Development of the Rockhouse mitigation site on the Salt arm of Roosevelt would require a diversion of about 2 cfs from the Salt River to support riparian habitat creation on the 20-acre pilot project. A maximum of 8 cfs would be diverted if mitigation on the Salt arm of Roosevelt is expanded to 75 acres. About 55 percent of the diverted streamflow would percolate through the alluvium back to the Salt River. The diversion of water to support the Rockhouse mitigation site would not appreciably affect surface water flow or water supplies.

**Ground Water.** There would be no change in ground water conditions from continued Full Operation of Roosevelt. Ground water pumping in the Salt River Valley would continue to be used as a supplemental water supply by SRP and municipalities subject to regulatory controls. Occasional releases of flood flows below Roosevelt would contribute to the recharge of the alluvial aquifer along the Salt and Verde rivers.

Depth to ground water under the Rockhouse mitigation site would remain about the same as historical levels.

**Flooding.** Periodic flooding downstream of Roosevelt would continue. The reservoir would maintain the capacity to capture the probable maximum flood. The release of flood flows would be similar to existing conditions (Figure 10). Salt River diversions for irrigation of the Rockhouse Farm site would not affect flooding or flood storage capacity.

**Water Quality.** Downstream water quality would remain similar to existing conditions. There would be no increased dilution of effluent from wastewater discharges at the 23<sup>rd</sup> Avenue or 91<sup>st</sup> Avenue WWTPs from floods. No measurable effect to water quality in Roosevelt or the Salt River would occur with water diversions for the Rockhouse Farm mitigation site.

#### ***4.2.2.3 Effects of Re-operation Alternative (Alternative 3)***

**Surface Water.** Under the Re-operation alternative, water above an elevation of 2,125 feet would be released from Roosevelt. The surface area of the reservoir when full would be 17,000 acres, which is a 21 percent decrease from the Full Operation alternative (Table 11). Conservation storage capacity would decrease to about 1.15 million AF, a decrease of about 29 percent compared to the Full Operation alternative. The average annual loss of water supplies available to SRP would be about 25,000 AF/yr compared to the Full Operation alternative (Table 12). In addition, the cities entitled to NCS water would lose more than 49,000 AF/yr on average. There would be a combined loss of water supply of about 74,000 AF. There may be a permanent loss of water rights for reservoir capacity above 2,125 feet elevation.

**Ground Water.** SRP ground water pumping would increase by about 14,000 AF/year; however, the cities would be unable to use their portion of the additional pumping because the limitations of the AWS designation as described for Alternative 1.

This would further increase the magnitude of impacts to municipal water users under the Re-operation alternative.

The additional spills at the Granite Reef Diversion Dam would likely have a positive impact on ground water recharge along the Salt River. A reduction in spills for the Verde reservoirs on average would slightly reduce ground water recharge to the alluvial aquifer along the Verde River.

**Flooding.** The Re-operation alternative would result in an additional 86,000 AF/yr of water being released on average during flood events compared with the Full Operation alternative as measured at Granite Reef (Table 12). All of the additional spills would occur on the Salt River. Average Verde River reservoir spills would be about 8,000 AF less under the Re-operation alternative because additional storage would be utilized in Horseshoe and Bartlett reservoirs and maximum annual spills would decrease about 117,000 AF. Maximum annual spills on the Salt River would increase 377,000 AF compared to the Full Operation alternative. Flood storage capacity at Roosevelt would increase from about 1.8 million AF to 2.3 million AF; however, the additional capacity is not needed because the reservoir is designed to handle the probable maximum flood.

**Water Quality.** Spills at Granite Reef would likely have a positive impact on water quality below the 23<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue WWTPs. The dilution of treated effluent would slightly improve water quality for downstream water users, although existing effluent discharges meet water quality standards. The extent of the water quality improvement would vary with the timing and volume of flood events. As with the No Permit alternative, flood events would occasionally increase turbidity and sediment transport in the Salt River below Roosevelt.

## 4.3 Vegetation

### 4.3.1 Affected Environment

Vegetation in the Roosevelt area includes primarily upland desert scrub on the rolling hills bordering the lake and riparian and wetland plant communities within the lakebed and along tributaries. Vegetation composition and structure have been influenced by a variety of land use practices including grazing, recreation, development, and construction of Modified Roosevelt dam. Upland, riparian, and wetland plant communities at Roosevelt along the lower Salt and Verde rivers are described below.

#### 4.3.1.1 Upland Plant Communities

Upland vegetation surrounding Roosevelt is characteristic of the Arizona upland subdivision of Sonoran Desert Scrub Community, which is represented by species such as blue palo verde (*Cercidium floridum*), foothill palo verde (*Cercidium microphyllum*), mesquite (*Prosopis* spp.), ironwood (*Oiweya tesota*), catclaw acacia (*Acacia greggii*), and crucifixion thorn (*Canotia halocantha*) (Turner and Brown 1982). The proposed Rockhouse mitigation site, although located within the historical floodplain of the Salt River, contains a component of desert scrub with species such as creosotebush, mesquite, saguaro (*Carnegiea gigantea*), buckhorn cholla (*Cylindropuntia acanthocarpa*), and

prickly pear cactus (*Opuntia* spp.). This site had been previously cleared of native vegetation for agricultural use.

#### **4.3.1.2 Riparian Plant Communities**

Prior to construction of Roosevelt in 1911, cottonwood and willow trees were present along the channels of the Salt River and Tonto Creek within the existing reservoir area. Most of this riparian vegetation occurred in narrow bands along streams. Intensive grazing throughout the Salt River and Tonto Creek watersheds in the late 1800s likely reduced the amount of riparian vegetation within the reservoir area prior to construction of Roosevelt Dam (FWS 1996, p. 14). In addition, this vegetation was susceptible to scouring natural flood events, which were exacerbated due to heavy livestock grazing on the watershed (Croxen 1926). Since reservoir creation, the amount of riparian vegetation has fluctuated with reservoir level and flood events. Currently, the riparian habitat at Roosevelt is a mixture of the Sonoran Riparian Deciduous Forest and Woodlands Biome, the Sonoran Riparian Scrubland Biome, and the Sonoran Interior Strands Biome. Representative species include Fremont cottonwood (*Populus fremontii*), Goodding willow (*Salix gooddingii*), seepwillow (*Baccharis salicifolia*), desert broom (*Bromus sarothroides*), arrowweed (*Pluchea sericea*), and salt cedar (*Tamarisk* spp) (Brown 1982).

The operation of Roosevelt is analogous to a natural ecosystem with cycles of riparian vegetation growth and loss; however, the cycle occurs more frequently than on a stream system. Riparian vegetation grows within the lakebed and along the margin of the lake and watercourses feeding the reservoir. Lake levels are primarily driven by the amount of precipitation in the watershed and reservoir releases. The changing lake levels that accompany normal operation of the reservoir result in constantly changing amounts, types, and distribution of riparian vegetation. At times, higher lake levels inundate and kill vegetation, but saturation of the lakebed also creates conditions favorable for establishment of new vegetation or rejuvenation of existing vegetation. At other times, lower lake levels expose newly deposited sediment and allow riparian vegetation establishment, but eventual desiccation of riparian vegetation in the upper portions of the reservoir likely occurs. This dynamic cycle of disturbance and regeneration creates and then periodically inundates habitat used by flycatchers, Yuma clapper rails, bald eagles, and cuckoos.

Riparian vegetation along much of the perimeter of Roosevelt Lake is extremely limited because of steep banks and seasonal and historical fluctuations in water levels that create a narrow margin of suitable conditions for that type of vegetation. Riparian vegetation is generally restricted to mouths of streams and the lakebed where slopes are gentle and there is available water from stream inflows, saturated soils, and the lake. At Roosevelt Lake, the most extensive stands of riparian vegetation are present at the Tonto Creek and the Salt River inlets.

Salt cedar (also known as tamarisk), an invasive non-native shrub or tree, is the dominant riparian plant at lower elevations of the lakebed. This species is most common on alluvial fans at the extreme lower end of Tonto Creek and along much of the Salt River from the lake up to an old diversion dam just below State Route 288. In these areas, salt cedar is often present in pure or nearly pure stands. Height and density are

related to available soil moisture, and trees growing over a shallow water table are generally taller and denser.

Salt cedar also is present along reaches of the Salt River and Tonto Creek upstream from Roosevelt, but trees are generally smaller and more scattered than those at the inflow to the lake, and are generally interspersed among native trees such as cottonwoods and willows. Stands of cottonwoods, willows, and salt cedars in various sizes and densities are present along the lower reach of Tonto Creek, with a general increase in the abundance of native trees upstream. The fragmented nature of these riparian habitats is due primarily to topography, watershed conditions, grazing, and human-induced factors. A few cottonwoods and willows are present in some of the patches of riparian woodland along the Salt River just upstream from Roosevelt Lake, but these woodlands are heavily dominated by salt cedar. Riparian species, such as cottonwood, and salt cedar are present in the active floodplain bordering the Rockhouse site, but there are no riparian plant communities currently on the mitigation site.

Several studies (SWCA 1999; ERO 2001; Ohmart 1979) have conducted detailed vegetation mapping on the Tonto Creek and Salt River arms of Roosevelt Lake in the project area. The most recent study (ERO 2001) was conducted to identify and characterize suitable habitat for the southwestern willow flycatcher. The Threatened and Endangered Species section contains additional information on riparian vegetation categories that provide flycatcher, Yuma clapper rail, bald eagle, and yellow-billed cuckoo habitat.

Riparian vegetation on the Salt River downstream of Roosevelt and downstream of Bartlett and Horseshoe dams on the Verde River, which may be affected by changes in water releases under the alternatives, is characteristic of river systems at low elevations in central Arizona. Between Stewart Mountain and Granite Reef dams on the Salt River, riparian vegetation is dominated by salt cedar, seepwillow, and mesquite with some cottonwood and willow (Reclamation 1987). Riparian vegetation along the Verde River below Horseshoe Dam consists of stands of mesquite, cottonwoods, willow and salt cedar interspersed with seepwillow and arrowweed. Vegetation density increases below Needle Rock where the river gradient lessens and the floodplain broadens to allow development of riparian vegetation. Below Granite Reef, riparian vegetation is absent except for short reaches upstream of the discharge point for the 23<sup>rd</sup> Avenue WWTP. Below that point, Sonoran riparian deciduous woodland, scrubland, interior strand, and interior marshland occur along the river channel and terraces (FWS 1999).

#### **4.3.1.3 Wetlands**

Wetlands are present along the Tonto Creek and Salt River inflows to Roosevelt. Tonto Creek and the Salt River flow through narrow steep-sided canyons prior to meandering through bottomland and floodplain areas before entering the lake. Sandy flats and marshy shallows support stands of cattails and herbaceous emergent wetlands in areas of high ground water or frequent short-term inundation. Wetlands within the Roosevelt lakebed are ephemeral and are typically distributed near the lake inlets. As the lake fills, wetlands are inundated and replaced by an aquatic environment. As lake levels decline, wetlands temporarily form along the perimeter of the drawdown pool. This cycle of temporary wetland formation and inundation is driven by reservoir fill and

drawdown cycles. Several small areas of cattail marsh have developed along the Tonto Creek inlet and provide potentially suitable habitat for Yuma clapper rail. Wetlands at the Tonto Creek and Salt River inlets are subject to periodic scouring from large precipitation events. Scouring of wetland vegetation is more likely to occur at lower reservoir elevations, when flood flows are not attenuated by the reservoir pool. The Rockhouse Farm site does not currently support wetlands.

### 4.3.2 Environmental Consequences

For all alternatives, changes in precipitation, stream flow, and reservoir water levels would affect vegetation composition and distribution at Roosevelt. Specific impacts to riparian vegetation as it relates to flycatcher, bald eagle, and cuckoo habitat are discussed in more detail in the Threatened and Endangered Species section.

#### 4.3.2.1 *Effects of No Permit Alternative (Alternative 1)*

**Upland Plant Communities.** Existing upland vegetation bordering Roosevelt would not change under the No Permit alternative; however, it is likely that the amount of upland vegetation in the Roosevelt lakebed above 2,095 feet would increase as ground water levels drop. The plant species composition above 2,095 feet would shift from periodic open water and riparian vegetation to a desert scrub habitat with an increase in creosote, mesquite, and saltbush.

**Riparian Plant Communities.** Under this alternative, reservoir levels would be held lower than historical levels thereby avoiding inundation of existing vegetation above 2,095 feet except during extreme flood inflows. Much of the riparian vegetation above 2,095 feet would be expected to degrade as the ground water level drops. If current drought conditions persist and low lake levels decrease further, the development of new riparian vegetation would continue to follow the receding waterline. Vegetation at higher elevations within the reservoir would dry-out and decay in the absence of periodic inundation or increased ground water levels. Above elevation 2,110 feet, most willow and cottonwood riparian vegetation would eventually die, but mesquite and some salt cedar would persist. Occasional short-term inundation from flood flows is not likely to establish and maintain willow and cottonwood vegetation above elevation 2,110 feet except along the inflow streams.

Areas along the Salt River and Tonto Creek would eventually become a riverine floodplain in the absence of periodic inundation by the lake. Riparian vegetation along the Salt River and Tonto Creek above elevation 2,095 feet would undergo the typical cycle of scouring and regrowth experienced along other rivers in the Southwest. Areas along the margin of the Roosevelt where the water table remains high also may support riparian vegetation. The extent of reservoir fluctuation under the No Permit alternative would be greatly reduced in comparison to the other two alternatives and, thus, riparian habitat would become more stable, but reduced in average extent over the long term.

The effect of frequent reservoir fills would be to restrict the growth of riparian vegetation to a band on the inflow deltas and on the edge of the reservoir near the high-water mark at elevation 2,095 feet. It is difficult to accurately estimate the amount of riparian vegetation that would be located along the perimeter of the lake.

**Wetlands.** Wetlands would continue to form temporarily along tributary inlets and would be periodically scoured by floods. The total wetland area is likely to decrease if the reservoir operates within a narrower band of elevations.

**Offsite Impacts.** Operation of Roosevelt to a maximum elevation of 2,095 feet would result in additional flood flow releases downstream from Roosevelt and on the Verde River on average compared to current operating conditions. However, maximum annual flood flows on the Verde would be reduced by 77,000 AF. The reduction in maximum annual flood flows on the Verde may slightly reduce scouring of riparian vegetation, but may decrease the disturbance needed for germination and growth of young trees. Additional flood flow releases may scour riparian vegetation along the Salt River; however, riparian habitat on the Salt River downstream of Roosevelt is limited because of existing reservoirs and diversions. Development of riparian vegetation below Granite Reef from additional spills is unlikely because releases would be sporadic and typically end in May.

#### ***4.3.2.2 Effects of Full Operation Alternative (Alternative 2)***

**Upland Plant Communities.** There would be no effect on upland plant communities surrounding Roosevelt. Small areas of upland vegetation within the lakebed would develop occasionally, but are unlikely to persist due to frequent inundation. Up to 75 acres of primarily upland desert scrub at the Rockhouse Farm or nearby sites would be converted to a riparian willow, cottonwood, and cattail marsh community. Additional minor disturbance of upland vegetation would occur with development of an access road along the existing Rockhouse Ditch and improvements to the ditch.

**Riparian Plant Communities.** The amount of riparian vegetation affected by Full Operation of Roosevelt would vary as reservoir levels rise or recede. There would be a succession of vegetation establishment and loss following inundation and drawdown cycles at the reservoir. It is difficult to predict the future changes in vegetation composition, structure, and distribution. The Threatened and Endangered Species section describes the approach used to estimate potential changes in riparian vegetation.

Proposed creation of riparian habitat at the Rockhouse Farm or nearby sites would convert up to 75 acres of desert scrub, including fallow agricultural land, to a riparian community. Water diversions from the Salt River would be used to establish and support willows, cottonwoods, and cattail marsh suitable for use by flycatchers, Yuma clapper rails, bald eagles, and cuckoos.

**Wetlands.** Wetlands would continue to form temporarily and be inundated by reservoir fill cycles or be scoured by flood inflows.

**Offsite Impacts.** No new impacts to vegetation outside of the Roosevelt area would occur with the Full Operation alternative. Periodic flood releases may scour riparian vegetation on the Salt River downstream of Stewart Mountain Dam and on the Verde River downstream of Bartlett Dam similar to current conditions. At least 1,500 acres of riparian habitat plus associated upland habitat would be acquired, managed, and enhanced as mitigation at multiple locations along the Verde River, San Pedro River, and elsewhere in south-central Arizona.

#### **4.3.2.3 *Effects of Re-operation Alternative (Alternative 3)***

**Upland Plant Communities.** Upland vegetation would continue to fluctuate annually due to varying water levels. Upper portions of the lakebed are expected to shift to upland dominated plant species such as mesquite and creosote, although these areas would still experience periodic inundation during flood events. Conversion of upland vegetation to riparian and wetland vegetation would occur at Rockhouse Farm or nearby sites similar to the Full Operation alternative.

**Riparian Plant Communities.** Re-operation of Roosevelt to a maximum elevation of 2,125 feet would result in periodic inundation and desiccation of riparian habitat similar to the Full Operation alternative. Over the long term, less riparian habitat is likely to be present on average because the range in reservoir levels and area of periodic inundation would be less.

**Wetlands.** Wetlands would continue to form temporarily and be inundated by reservoir fill cycles or be scoured by flood inflows. A slight decrease in wetland area may occur since the area of periodic inundation would decrease.

**Offsite Impacts.** Additional spill of flood flows (94,000 AF on average) from Roosevelt would have a minor effect on Salt River riparian vegetation downstream of Stewart Mountain Dam (the lowest Salt River dam) from scouring. Development of riparian vegetation below Granite Reef is unlikely because of the sporadic nature of spills and the lack of spills after May. Reduced spills from Verde River reservoirs (8,000 AF on average) would slightly reduce scouring of riparian vegetation and the potential for disturbance and regeneration of young trees. Additional riparian and associated upland habitat would be acquired, managed, and enhanced as mitigation under the Re-operation alternative.

## **4.4 Geology and Soils**

### **4.4.1 Affected Environment**

Roosevelt Lake is located in the Mountain Region of the Transition Zone Physiographic Province, with topography ranging from rolling hills to steep and rugged mountains with deep, narrow canyons. Outcroppings of rock in the region are primarily older Precambrian granitic and metamorphic rocks overlying younger Precambrian and Paleozoic sedimentary rocks (Reclamation 1996a). Soils surrounding Roosevelt vary from silty or clayey to sandy or gravelly in composition (Id.).

The Rockhouse Farm mitigation site is located on a near level bench within an alluvial terrace adjacent to the Salt River inflow to Roosevelt. The fallow agricultural fields at the Rockhouse Farm have 2 to 6 feet of sandy loam overlying cobbly sandy alluvium. Depth to the cobbly alluvium is shallowest near the Salt River and generally increases with distance from the river. The soil profile above the cobbles is slightly calcareous, nonsaline, and nonsodic.



## **4.4.2 Environmental Consequences**

Potential impacts to geologic and soil resources at Roosevelt would be limited for all alternatives because of the lack of ground disturbing activities, although changes in the maximum reservoir pool would affect existing zones of sediment deposition and scouring at the reservoir inlets. Creation of riparian and wetland habitat at the Rockhouse Farm site for Alternatives 2 and 3 would require ground disturbance.

### ***4.4.2.1 Effects of No Permit Alternative (Alternative 1)***

Maintaining a lower maximum reservoir pool under the No Permit alternative would result in changes to the geomorphic characteristics of the Salt River and Tonto Creek inflows and other smaller tributaries. The scouring and deposition of sediments from stream inflows would shift downstream near the new maximum reservoir elevation of 2,095 feet. A new stream channel equilibrium would be established over time with the formation of a delta near the new reservoir inlet.

### ***4.4.2.2 Effects of Full Operation Alternative (Alternative 2)***

The deposition and scouring of sediments near Roosevelt inlets on the Salt River and Tonto Creek would be similar to existing conditions and would vary with the amount of runoff and lake level.

Implementation of proposed plans to create riparian habitat at Rockhouse Farm would require tillage and disturbance to soil resources on 20 acres of fallow agricultural land. No substantial earth moving activities are anticipated. Site preparation would be conducted to provide a suitable seedbed and for planting riparian vegetation. Additional soil disturbance would be needed for construction of a 0.6-mile long and 10-foot wide maintenance road along the ditch. This would result in a minor long-term loss in soil productivity along the road. Adequate drainage and revegetation measures would be used to prevent erosion. Sediment from the ditch delivering water to the mitigation site would be placed adjacent to the access road.

### ***4.4.2.3 Effects of Re-operation Alternative (Alternative 3)***

Changes in the deposition and scouring of sediment at the Roosevelt inlets would be similar to the No Permit alternative and would shift downstream near the maximum pool elevation of 2,125 feet. Soil disturbances at Rockhouse Farm would be the same as Alternative 2.

## **4.5 Wildlife and Aquatic Resources**

### **4.5.1 Affected Environment**

#### ***4.5.1.1 General Wildlife***

Wildlife in the Roosevelt area is characteristic of the Sonoran Desert Scrub community as described by Turner and Brown (1982). A diversity of mammals is present in the desert scrub vegetation surrounding the reservoir and riparian habitat on the Salt River and Tonto Creek arms and the lakebed. Big game species such as mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and javelina

(*Tayassu tajacu*) are occasionally seen, although populations are greater in the adjacent uplands. Predators in the area include coyote (*Canis latrans*), bobcat (*Lynx rufus*), and gray fox (*Urocyon cinereoargenteus*). Non-game species such as beaver (*Castor canadensis*) and raccoon (*Procyon lotor*) occur in riparian areas. Numerous birds are found in upland, riparian, and open water habitats at Roosevelt including great blue heron (*Ardea herodias*), green-winged teal (*Anas crecca*), common flicker (*Colaptes auratus*), and red-tailed hawk (*Buteo jamaicensis*). Hunting for Gambel's quail (*Callipepla gambelii*) and dove (*Zenaida* spp.) is popular in the area.

Wildlife species along the lower Salt and Verde rivers and at the mitigation sites are similar to the wildlife present in riparian and nearby upland habitats at Roosevelt and central Arizona.

#### **4.5.1.2 Forest Service Management Prescriptions**

The majority of the lands surrounding Roosevelt are managed by the Forest Service in accordance with the Tonto Forest Plan (USDA 1985). Management prescriptions in the Tonto Forest Plan include managing desert scrub vegetation to emphasize production of javelina and Gambel's quail. Prescriptions in the higher elevation of the desert scrub type emphasize desert cottontail (*Sylvilagus audubonii*) production.

**Javelina.** The javelina is found in many habitats. Prickly pear cactus makes up the major portion of the diet. Mountain lions, bobcats, and coyotes are common predators of javelina (AGFD 2002).

**Gambel's Quail.** Gambel's quail is distributed in desert shrub habitat throughout Arizona. In drier portions of its range, riparian vegetation becomes increasingly important. Dominant plant species in Arizona include mesquite, various acacias and mimosas, along with saguaro, prickly pear, barrel, and cholla cacti.

**Desert Cottontail.** The desert cottontail can be found in a variety of habitats, varying from grassland to creosotebush and cactus deserts. It can also inhabit woodlands, and it ranges in elevation from sea level up to about 6,000 feet.

#### **4.5.1.3 Forest Service Management Indicator Species**

The Tonto Forest Plan is intended to ensure that fish and wildlife habitats on National Forest lands are managed to maintain viable populations of existing native vertebrate species (USDA 1985). Table 13 lists management indicator species in the Roosevelt area and the habitats or vegetation types they are intended to monitor.

**Table 13. Tonto National Forest management indicator species for the Roosevelt area.**

| Common Name                         | Scientific Name                 | Habitat/Vegetation Type   |
|-------------------------------------|---------------------------------|---------------------------|
| <b>Riparian</b>                     |                                 |                           |
| Bald eagle                          | <i>Haliaeetus leucocephalus</i> | General riparian          |
| Bell's vireo                        | <i>Vireo bellii</i>             | Well developed understory |
| Summer tanager                      | <i>Piranga rubra</i>            | Tall mature trees         |
| Hooded oriole                       | <i>Icterus cucullatus</i>       | Medium sized trees        |
| <b>Desert Scrub Vegetative Type</b> |                                 |                           |
| Black-throated sparrow              | <i>Amphispiza bilineata</i>     | Shrub diversity           |
| Canyon towhee                       | <i>Pipilo fuscus</i>            | Ground cover              |

Source: USDA 1985.

#### 4.5.1.4 Fisheries

Fish in the Roosevelt project area are typical of reservoir and riverine habitats in central Arizona. Fish species in the lake are largely introduced species including largemouth bass (*Micropterus salmoides*), black crappie (*Pomox nigromaculatus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), green sunfish (*Chaenobryttus cyanellus*), yellow bullhead (*Ictalurus natalis*), carp (*Cyprinus carpio*), bigmouth buffalo (*Ictiobus cyprinellus*), threadfin shad (*Dorosoma petenense*), channel catfish (*Ictalurus punctatus*), and flathead catfish (*Pilodictis olivaris*). Native fish recorded in Tonto Creek include Sonora sucker (*Catostomus insignis*), desert mountain sucker (*Pantosteus clarki*), longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*), and roundtail chub (*Gila robusta*). Razorback suckers (*Xyrauchen texanus*), and Colorado squawfish (*Ptychocheilus lucius*) have been experimentally stocked on the Salt River above the old diversion dam, but no wild populations have been established (Reclamation 1996a). Sampling in the late 1980s revealed no native fish in the Salt River for 25 miles upstream of Roosevelt except for a single stocked razorback sucker (SWCA and SRP 1989).

### 4.5.2 Environmental Consequences

#### 4.5.2.1 Effects of the No Permit Alternative (Alternative 1)

**Wildlife and Fishery Impacts.** Operation of Roosevelt to a maximum elevation of 2,095 feet is expected to result in a shift in the composition of the vegetation communities within the existing lakebed as described in the previous section on vegetation. The expansion of upland vegetation, including mesquite bosques and desert scrub habitat, would favor species such as javelina, mule deer, coyotes, Gambel's quail, and small mammals. Habitat for desert cottontail would not be affected. Wildlife favoring riparian habitat would be restricted to a fringe of riparian habitat primarily near the Salt River and Tonto Creek inlets to the reservoir. Narrower fluctuations in reservoir levels are likely to create less riparian habitat over the long-term than operation of

Roosevelt with larger conservation space. Wildlife habitat along the Salt River and Tonto inlets to Roosevelt would vary with precipitation events and periodic scouring, sediment deposition, and regrowth.

Populations of Forest Service Management Indicator species such as Bell's vireo, summer tanager and hooded oriole that use riparian habitat likely would decrease. Black throated sparrow and canyon towhee, which prefer upland habitat, may benefit from additional upland habitat.

The lower reservoir water levels under the No Permit alternative would reduce shallow water fishery habitat and a greater percentage of the reservoir would provide deepwater habitat. Inundated shoreline vegetation would be less available to structure-oriented species such as bass and crappie.

**Offsite Impacts.** Indirect impacts to wildlife are possible from hydrologic changes downstream from Roosevelt and on the Verde River. Increased spills and greater pass-through of flood flows at Roosevelt under the No Permit alternative may affect riparian and aquatic habitat for fish and wildlife along the Salt River. On the Verde River, spills at Horseshoe and Bartlett reservoirs would increase about 5 percent on average (8,000 AF/year), which is likely to have nominal effect on wildlife habitat. Maximum Verde flood flows would be reduced by about 6 percent, which could change the composition of riparian wildlife habitat. Average monthly streamflows below Bartlett Reservoir would increase slightly in December, February, and April, and would be lower or the same in other months compared to the Full Operation alternative. The net effect to fisheries and aquatic life from Verde River flow changes is likely to be minor. There may be a slight adverse impact on riparian and aquatic wildlife at Bartlett and Horseshoe reservoirs due to lower average reservoir levels (Table 12).

#### ***4.5.2.2 Effects of Full Operation Alternative (Alternative 2)***

**Wildlife and Fishery Impacts.** The Full Operation alternative would have the greatest fluctuation in lake levels of the alternatives being evaluated. Habitat for wildlife favoring riparian species would vary from year to year. During periods of extended draw down, riparian habitat would increase similar to current conditions. When the lake is full, there would be less habitat for wildlife favoring riparian vegetation. Over the long-term, it is expected that there would be a cycle of vegetation growth, inundation, and decadence depending on climatic conditions. There would be no effect to existing habitat used by upland species under the Full Operation alternative. Forest Service Management indicator species and Management Prescription species would not change.

During periods of high water under Full Operation, the primary productivity of the lake would be expected to increase as fish take advantage of food resources and cover provided by inundated vegetation. At high reservoir levels, areas of shallow water likely would increase, providing additional breeding and foraging areas for species such as carp and catfish. Low reservoir levels would increase deep water habitat and reduce shallow water forage and spawning areas.

Conversion of up to 75 acres of upland habitat to riparian and wetland habitat at the Rockhouse Farm site would reduce available habitat for upland species such as black-throated sparrow and canyon towhee. Because upland habitat is abundant in the region,

potential impacts to wildlife would be negligible. Creation of this riparian and wetland habitat would benefit wildlife species such as Bell's vireo, summer tanager, and hooded oriole. There would be no impact to aquatic species.

**Offsite Impacts.** There would be no change in wildlife and aquatic habitat on the Salt River below Roosevelt or on the Verde River under the Full Operation alternative. Fish and wildlife along the Salt and Verde rivers would continue to be affected by periodic spills, flood flows, and natural climatic variations. Wildlife would benefit from the riparian and adjacent upland habitat acquired as mitigation for this alternative along the Verde and San Pedro rivers and other locations. Aquatic life also would benefit from acquisition and management of riparian habitat along streams and the retirement of agricultural water rights at mitigation sites.

#### ***4.5.2.3 Effects of the Re-operation Alternative (Alternative 3)***

**Wildlife and Fishery Impacts.** Upland habitat above 2,125 feet would increase slightly, favoring species such as black-throated sparrow, and small and medium size mammals. Upland Forest Service Management Indicator species, including black-throated sparrow and canyon towhee, also would benefit slightly from greater upland habitat. Riparian habitat for wildlife use would fluctuate annually at elevations primarily below 2,125 feet subject to periodic inundation. Forest Service Management Indicator species that use riparian habitat are unlikely to be significantly affected because reservoir re-operation would largely maintain riparian habitats, although on average the amount of riparian habitat is likely to decrease compared to the Full Operation alternative. Less shallow water habitat would be available for fish compared to the Full Operation alternative.

The effect on wildlife at the Rockhouse Farm mitigation site would be the same as the Full Operation alternative.

**Offsite Impacts.** Indirect effects to wildlife and aquatic species downstream of Roosevelt and on the Verde River are possible. An increase in average spills and maximum spills below Roosevelt, particularly during flood events, could affect riparian vegetation composition and wildlife habitat on the Salt River. Average spills from Verde River reservoirs would be slightly less or the same as the Full Operation alternative for all months except February. A decrease in annual maximum spills on the Verde River also could affect habitat for aquatic and wildlife species, although it is difficult to determine if impacts would be beneficial or adverse. The net effect on aquatic life in the Verde River is likely to be minor. Wildlife and aquatic species would benefit from the riparian and adjacent upland habitat acquired and managed as mitigation for this alternative.

## 4.6 Endangered, Threatened, Candidate, and Sensitive Species

### 4.6.1 Affected Environment

Two federally listed endangered species, the southwestern willow flycatcher and Yuma clapper rail, one federally listed threatened species, the bald eagle, and one candidate for Federal listing, the yellow-billed cuckoo, have been identified by FWS as having suitable habitat and presence at Roosevelt (Table 14). Habitat requirements and available habitat at Roosevelt Lake for these four species are discussed below. In addition, several other wildlife, fish, and plant species of concern found near Roosevelt Lake are also discussed in this section. Additional information on threatened, endangered, and candidate species at Roosevelt is found in the RHCP (SRP 2002c).

**Table 14. Threatened, endangered, and candidate wildlife species at Roosevelt.**

| Common Name                    | Scientific Name                       | Species Status | Record of Presence In or Near the Project Area | Suitable Habitat Exists |
|--------------------------------|---------------------------------------|----------------|--|-------------------------|
| Southwestern willow flycatcher | <i>Empidonax traillii extimus</i>     | Endangered     | ✓  | ✓                       |
| Yuma clapper rail              | <i>Rallus longirostris yumanensis</i> | Endangered     | ✓  | ✓                       |
| Bald eagle                     | <i>Haliaeetus leucocephalus</i>       | Threatened     | ✓  | ✓                       |
| Yellow-billed cuckoo           | <i>Coccyzus americanus</i>            | Candidate      | ✓  | ✓                       |

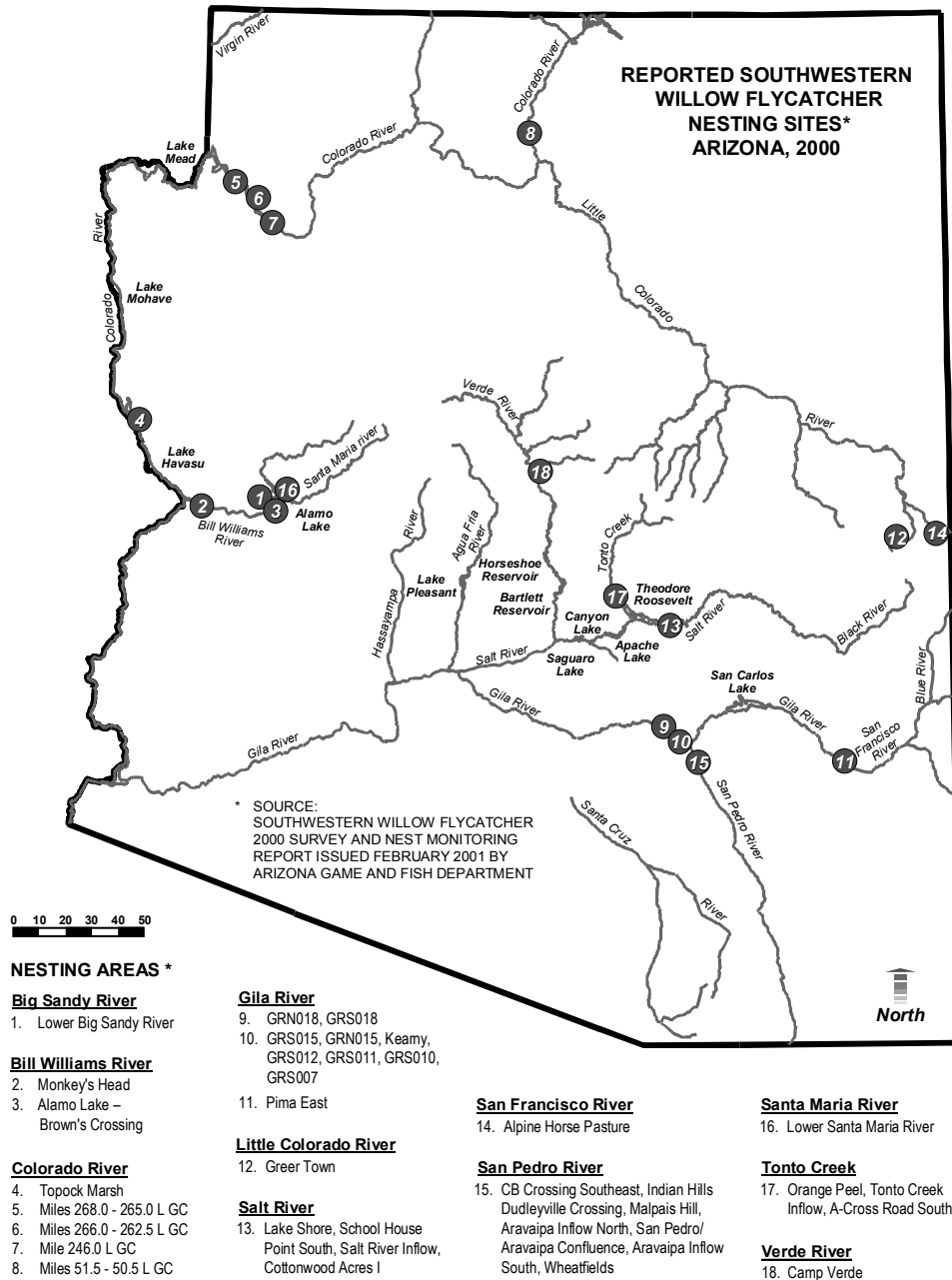
Source: AGFD 2001; Yuma clapper rail-field observation.

#### 4.6.1.1 Southwestern Willow Flycatcher

**Distribution and Status.** The southwestern willow flycatcher is a bird that historically inhabited river valleys in southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico (FWS 2001b). Declining numbers of flycatchers and a reduction in its historic range led to consideration, and eventual implementation, of Federal action to protect the bird, which was designated as endangered on March 29, 1995 (FWS 1995a). No critical habitat is currently designated for the flycatcher. Three other subspecies, *E.t. brewsteri*, *E.t. adastus*, and *E.t. traillii*, are not federally listed. The southwestern willow flycatcher is listed as a species of special concern in Arizona (AGFD 1996 in prep.)

Statewide as of the year 2001, flycatchers have been documented along 12 drainages in Arizona (Figure 11 shows nesting areas in 2000), with most flycatchers being found at Roosevelt and along the San Pedro River and the Gila River near Winkelman (McCarthy et al. 1998; Paradzick et al. 1999, 2000, 2001; Smith et al. 2002). In 2002, flycatchers were found at Horseshoe Reservoir, the uppermost dam operated by SRP on

**Figure 11. Reported Southwestern Willow Flycatcher Nesting Sites in Arizona, 2000**



the Verde River (Willard, pers. comm. 2002). During the June 2, 2003 survey, five flycatcher territories were identified with at least one nesting pair (Id.). All of the territories were located in the upper end of Horseshoe Reservoir at an elevation of about 2000 feet.

**Flycatcher Breeding and Foraging Habitat Characteristics.** Flycatchers are found in three basic habitat types: 1) native-dominated vegetation; 2) exotic-dominated vegetation; and 3) mixed native and exotic plants (FWS 2001b). Lower to mid-elevation native-dominated areas contain species such as willows (*Salix* spp.), cottonwoods (*Populus* spp.), boxelder (*Acer negundo*), ash (*Fraxinus* spp.), alder (*Alnus* spp.), and buttonbush (*Cephalanthus occidentalis*). Canopy height can vary from 13 to 98 feet, often with a distinct overstory canopy and a dense mid-story and understory layer although some areas of dense monotypic willow are also used for nesting (FWS 2001b). In almost all cases, slow-moving water or still surface water and/or saturated soil is present at or near breeding sites during wet or non-drought years.

High elevation native-dominated areas consist mainly of a single species of willow (*Salix exigua* or *S. geyeriana*), and canopy height is usually only 10 to 23 feet with no distinct vegetation layers (FWS 2001b). Sites dominated by exotic species such as salt cedar and Russian olive (*Eleagnus angustifolia*) usually form a dense closed canopy with high vertical foliage and stem density (FWS 2001b). According to the Southwestern Willow Flycatcher Recovery Team recommendation, "... among sites with tamarisk, in most cases, highest quality habitat is provided where the tamarisk is tall and dense, and where it is intermixed with native riparian trees and shrubs" (FWS 2001b, p. 14). This exotic-dominated habitat type is typical of many of the willow flycatcher nesting areas at Roosevelt Lake. Breeding areas with mixed native and exotic plants often contain an overstory canopy of native cottonwoods and willows, with a dense midstory and understory of salt cedar or Russian olive.

Flycatchers generally breed at elevations ranging from near sea level to over 7,000 feet (Bent 1940; Stafford and Valentine 1985; Harris et al. 1987; Spencer et al. 1996). In early May to early June, most flycatchers migrate from wintering areas in Mexico, Central America, and northern South America to their breeding areas. Nest height can range from 1.6 to 60 feet above the ground. Flycatchers lay 3 to 4 eggs in small open cup-shaped nests and the young fledge about 25 days after the first egg is laid. Up to four nesting attempts may be made per season (Smith et al. 2002). Depending on the vegetation type, quality of the habitat, nesting stage, and population density, territory size can range from 0.25 to 5.7 acres (FWS 2001b). Flycatchers depart in late July and August after nesting (FWS 2001b).

Dense patches of nesting trees or shrubs are often interspersed with small open areas where flycatchers forage (FWS 2001b). Habitat characteristics of areas occupied by flycatchers vary across their range, and some areas that appear similar to occupied breeding areas remain unused (Paradzick et al. 2001). Thin strands of dense vegetation are generally not suitable, and patch size, arrangement of patches, and open areas appear to influence whether or not an area is occupied.



**Threats to the Flycatcher.** Arizona has experienced one of the steepest declines in flycatcher population (Unitt 1999). “Unitt (1987) concluded that probably the steepest decline in the population levels of ... extimus has occurred in Arizona ... extimus has been extirpated from much of the area which it was originally described, the riparian woodlands of southern Arizona.” Loss and modification of riparian habitat due to urban and agricultural development, water diversion and impoundment, channelization, ground water pumping, livestock grazing, invasion by non-native plant species, as well as off-road vehicle and other recreational uses, have contributed to the decline of flycatchers (Reclamation and SWCA 1995). Loss of wintering habitat also may play a role in population declines (Unitt 1999). Flycatchers winter in areas with standing or slow-moving water, seasonally inundated savannas, patches of dense woody shrubs, patches or stringers of trees in Mexico, Central America and northern South America (Phillips 1948; Gorski 1969; McCabe 1991; Koronkiewicz et al. 1998; Unitt 1999). Potential for fire in salt cedar stands is another threat, as occurred on the San Pedro River at the PZ Ranch in 1996.

Brown-headed cowbird nest parasitism can result in flycatcher nesting failure (FWS 1993b). Some measures to control brown-headed cowbird, including trapping and fencing to control cattle movement, appear to have reduced brood parasitism (Spencer et al. 1996; Sferra et al. 1997; McCarthy et al. 1998; Paradzick et al. 1999, 2000, 2001; Smith et al. 2002). Flycatcher nests parasitized by brown-headed cowbirds at Roosevelt was less than 2 percent between 1997 and 2001 (Id.).

#### **Flycatcher Habitat at Roosevelt Lake.**

*Historical Habitat Trends.* The location and amount of flycatcher habitat at Roosevelt Lake fluctuates annually with the amount of precipitation that falls in the Salt River and Tonto Creek watersheds and reservoir operation. Both lake drawdown (dropping water levels) and filling (rising water levels) result in a cycle of habitat creation and loss. Periods of abundant precipitation generally lead to higher lake levels and elimination of some habitat through inundation. The pattern is reversed during periods of drought, as the lake level drops. Eventually, declining lake levels are likely to lead to the decay of riparian vegetation at higher elevations of the lakebed due to a reduction in soil moisture and a lower ground water level. This is evident on both the Salt and Tonto Creek inlets to Roosevelt, where portions of the lakebed have not been inundated for several years. Declining lake levels also lead to the establishment of new riparian habitat on exposed mud flats near the receding lake. Establishment of new, suitable flycatcher habitat generally takes 3 to 5 years. Historically, the water elevation—and therefore the amount of suitable flycatcher habitat—at Roosevelt Lake has fluctuated widely (Figure 7).

The cycle of inundation, drawdown, riparian growth, and subsequent vegetation decadence of suitable flycatcher habitat is similar to patterns exhibited by natural riparian ecosystems, although the seasonal timing of inundation and drawdown at Roosevelt may not match natural systems. As stated in the Southwestern Willow Flycatcher Recovery Team Recommendation, “Historically, these habitats have always been dynamic and unstable in place and time, due to natural disturbance and regeneration events such as floods, fire, and drought” (FWS 2001b, p. 32). The draft Plan also states, “Furthermore,

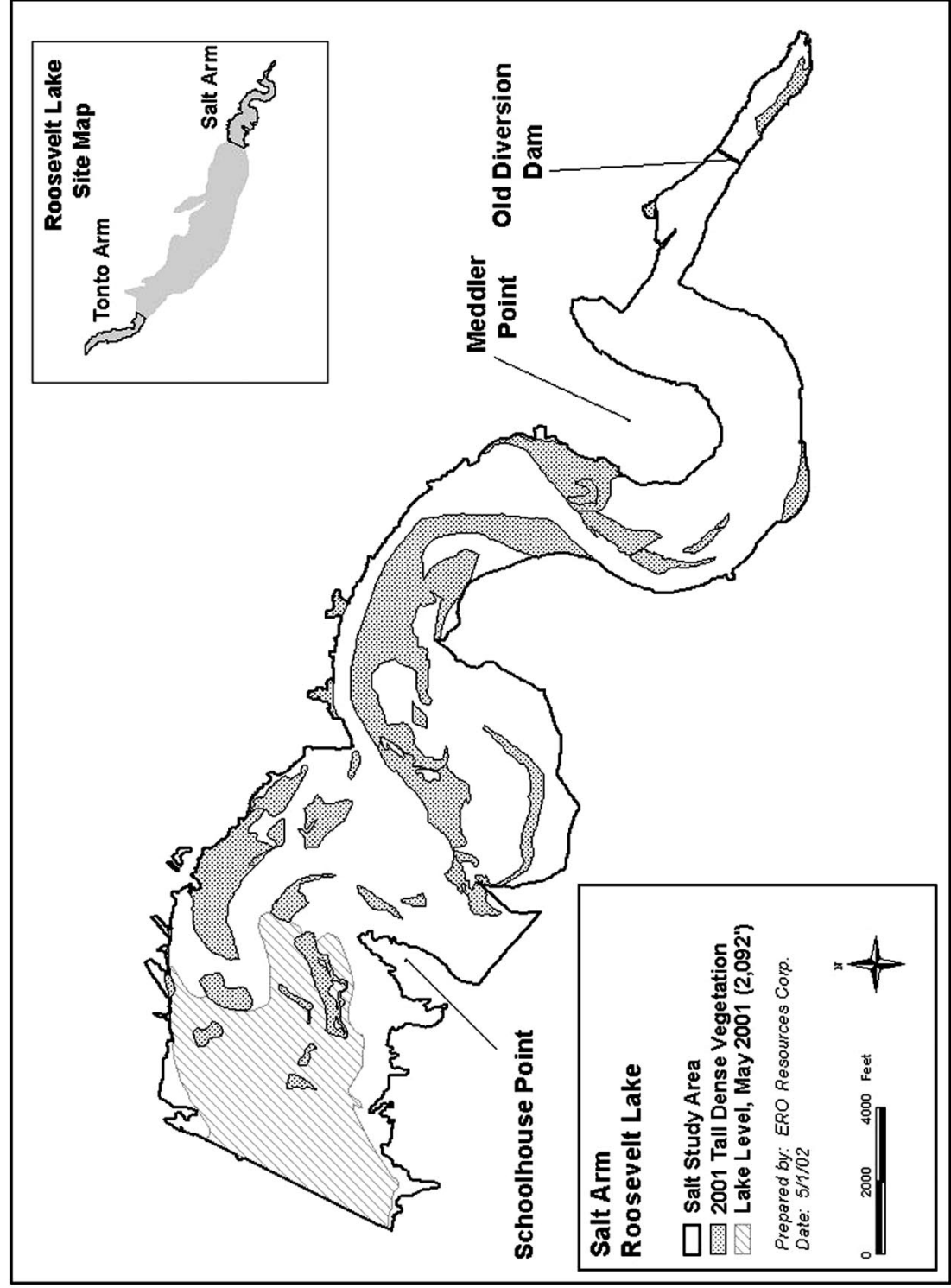
as the vegetation at a site matures, it can lose the structural characteristics that make it suitable for breeding flycatchers. These and other factors can destroy or degrade breeding sites, such that one cannot expect any given breeding site to remain suitable in perpetuity” (FWS 2001b, p. 80).

*Current Habitat Characteristics.* Vegetation at the Salt River inflow to Roosevelt Lake varies from dense, predominately monotypic stands of salt cedar, willow, or salt cedar-dominated patches with an overstory of willows or cottonwoods. Additional stands of riparian habitat have become established on the reservoir bed as water levels in the lake have receded during the past 6 years (Smith et al. 2002), and an increasing number of mixed riparian patches have developed into suitable and occupied flycatcher breeding habitat. Riparian vegetation on the Tonto Creek inlet occurs in several distinct patches, some of which are mixed riparian with a cottonwood/willow overstory and salt cedar understory, while other areas are composed almost entirely of salt cedar.

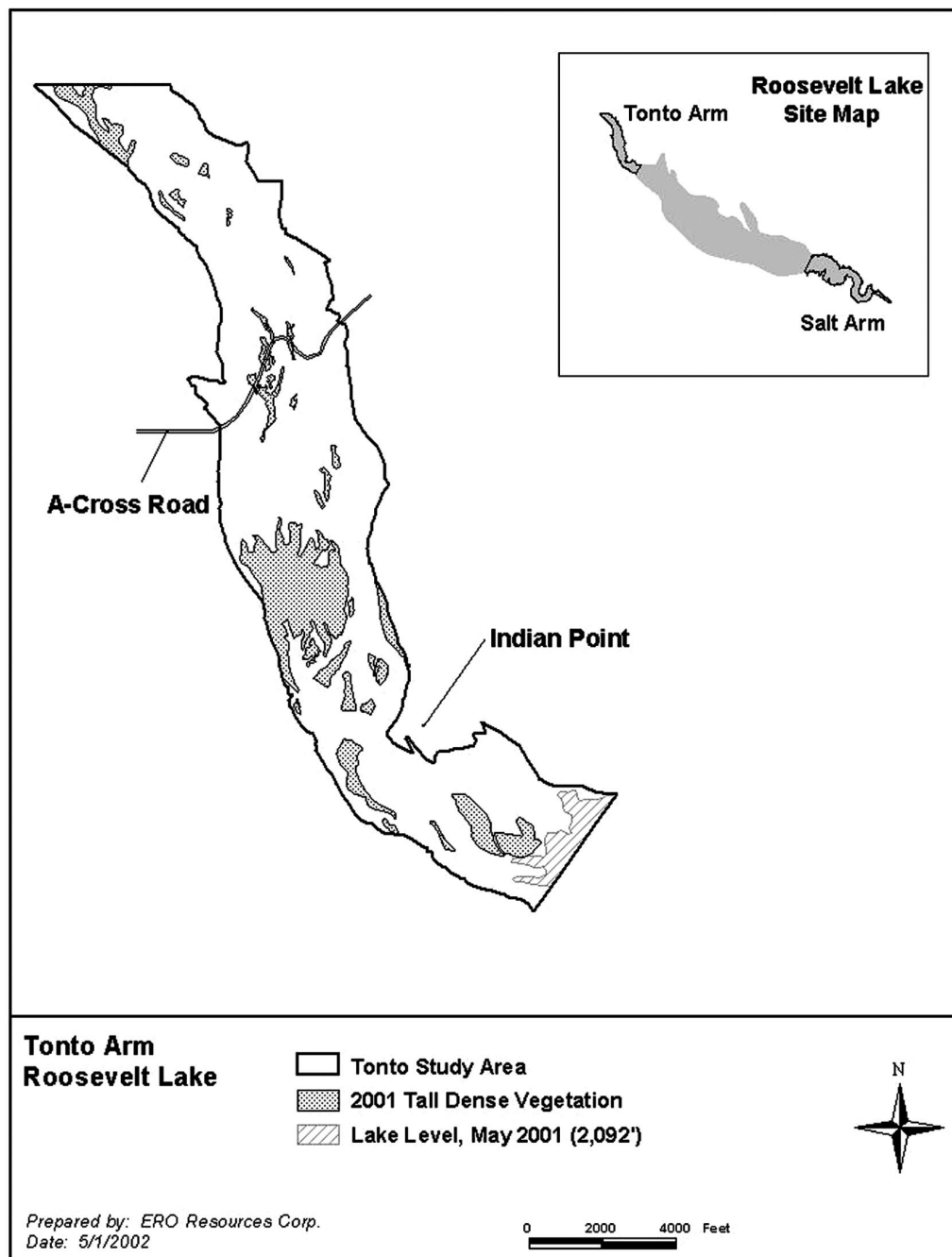
Riparian vegetation at Roosevelt has been mapped into two principal categories: 1) tall dense vegetation, some of which is currently used as nesting habitat by flycatchers (Figure 12 and Figure 13); and 2) other vegetation types that are not currently suitable for flycatcher nesting (ERO 2001). Vegetation mapping at Roosevelt was used to establish a basis for the analysis of impacts to existing and future changes in vegetation characteristics. Tall dense vegetation is composed of three vegetation types: 1) cottonwood/willow; 2) mixed riparian; and 3) salt cedar, all greater than 15 feet in height. Some patches of tall dense vegetation currently are occupied by flycatchers or provide suitable nesting habitat. A threshold height of 15 feet, as suitable nesting habitat, is based on data collected by AGFD at Roosevelt during several years of investigation (McCarthy et al. 1998, p. 73; Paradzick et al. 1999, p. 97; Paradzick et al. 2000, p. 92; Paradzick et al. 2001, p. 82). From these previous studies, the average nest height is about 23 feet with a standard deviation of about 6 feet. Thus, over 70 percent of nests are estimated to be located in trees and shrubs with a height greater than 15 feet. “Dense” indicates a predominately closed canopy as viewed from aerial photographs. The cumulative acreage of tall dense vegetation at Roosevelt suitable for flycatchers increases with elevation (Figure 14). A total of about 1,000 acres of tall dense riparian habitat was present within the Roosevelt lakebed below an elevation of 2,151 feet in 2001. As Figure 14 illustrates, lower portions of the lakebed contain less tall dense riparian habitat because these areas were recently inundated. At higher lakebed elevations the amount of tall dense vegetation also begins to decline because areas above an elevation of 2,136 feet historically did not have the hydrology to support large amounts of riparian vegetation growth.

Other vegetation types not typically used as breeding habitat by flycatchers were less than 15 feet tall, had sparse canopy cover, or were dying at the time the mapping was completed. This category includes mesquite bosques (woodlands) and herbaceous non-woody vegetation. Portions of these other vegetation types provide habitat for flycatchers to forage and disperse, and serve as an environmental buffer.

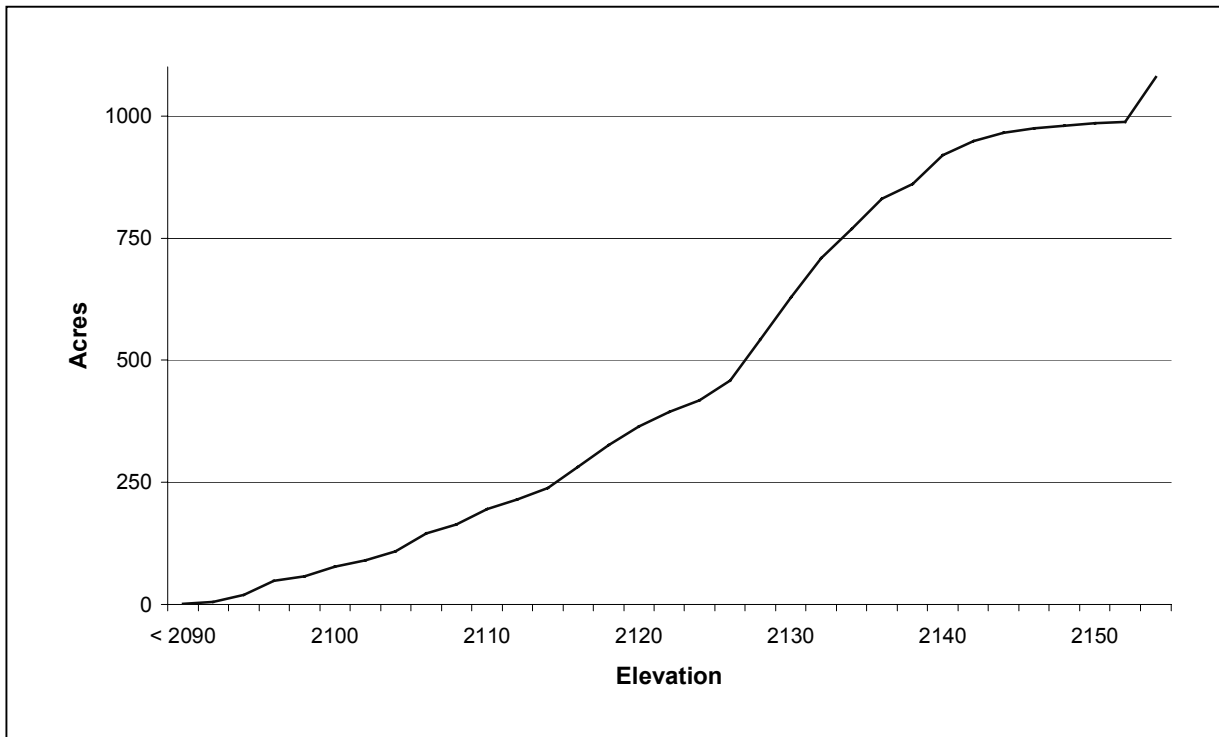
Figure 12. 2001 Tall Dense Vegetation, Salt Arm.



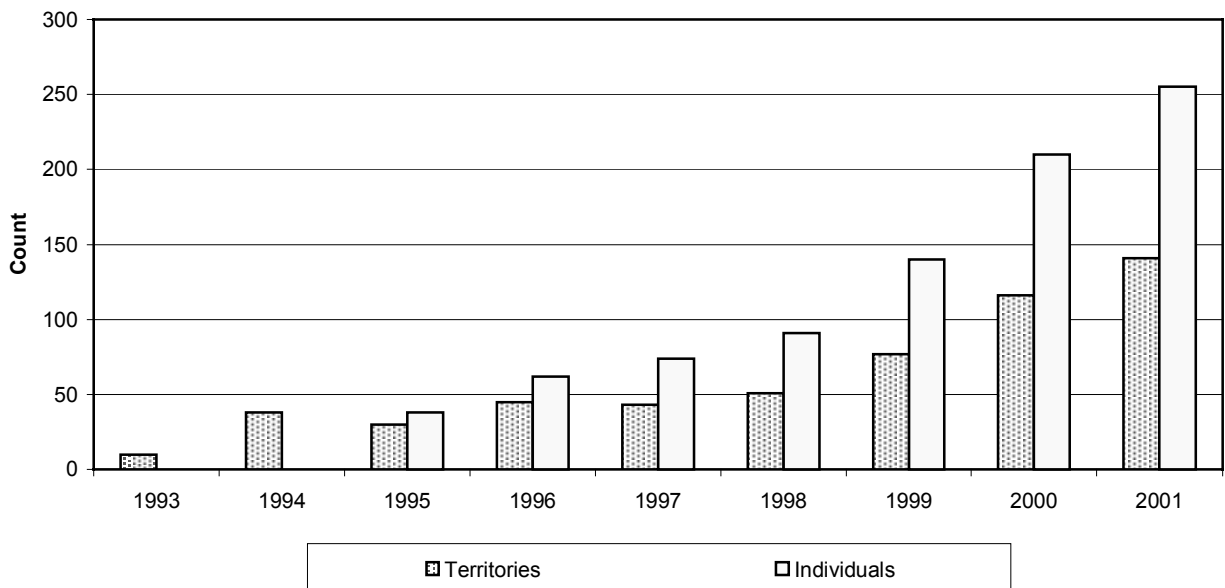
**Figure 13. 2001 Tall Dense Vegetation, Tonto Arm.**



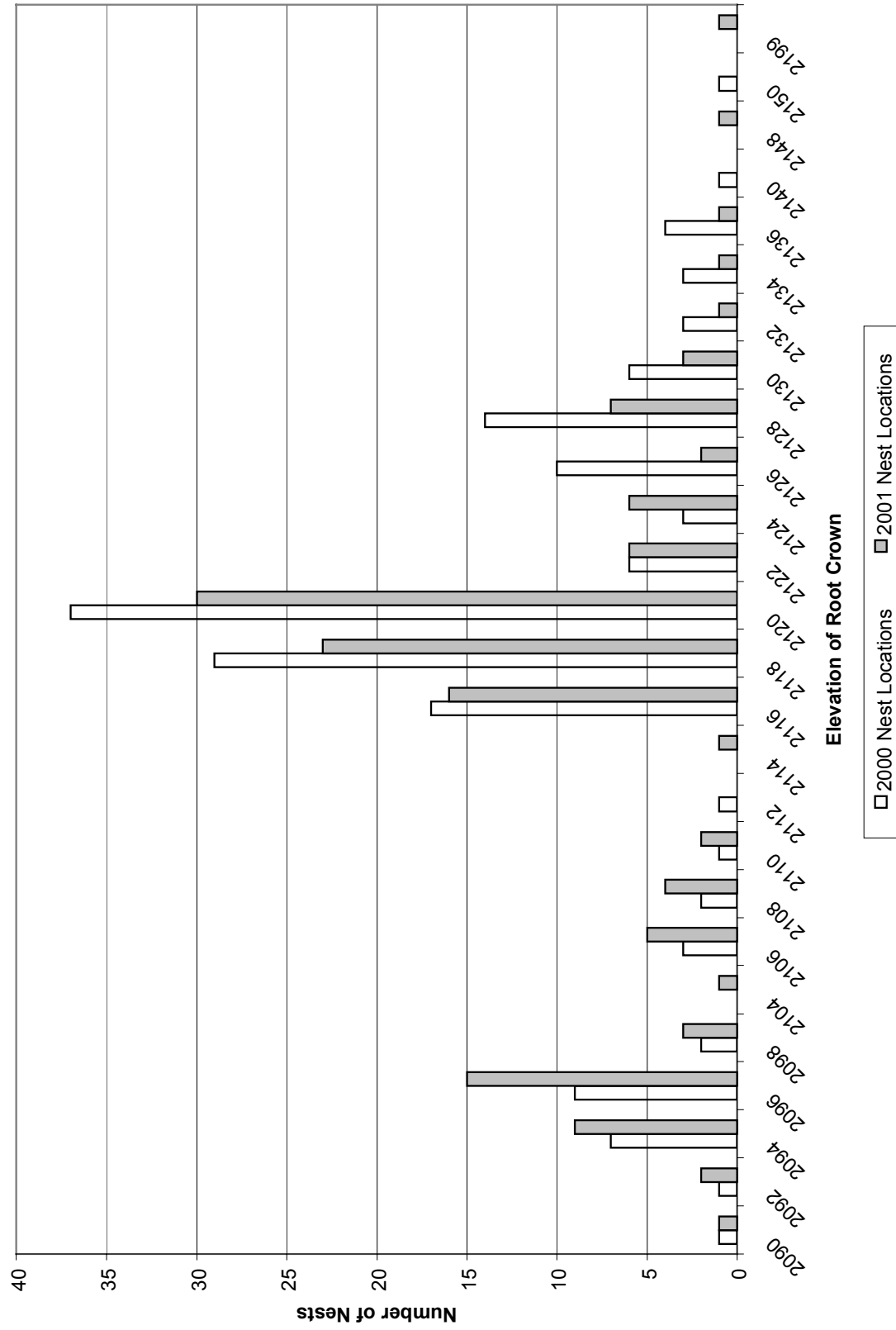
**Figure 14. Acreage of tall dense vegetation at Roosevelt Lake by elevation in 2001.**



**Figure 15. WIFL Territories and Individuals at Roosevelt Lake, 1993 to 2001.**



**Figure 16. Distribution of flycatcher nests and territories at Roosevelt by elevation, 2000 and 2001.**



**Flycatcher Presence at Roosevelt Lake.** Roosevelt Lake was not surveyed for flycatchers until 1993, and their presence or absence until that time is uncertain. The number of flycatcher territories and individuals at Roosevelt has grown steadily since 1993 (Figure 15). Although there was a slight decrease in the number of territories in 1995 and 1997, the total number of territories detected increased over 10-fold from 1993 to 2001. In 2001, 255 individuals and 141 territories were identified at the Salt River and Tonto Creek inflows to Roosevelt Lake (Smith et al. 2002). This represents about 40 percent of flycatchers in Arizona, with 32 percent located at the Salt River inflow and 8 percent at the Tonto inflow.

The distribution of flycatcher nests and territories at Roosevelt by elevation in 2000 and 2001 is shown in Figure 16. The largest number of nests at Roosevelt in both 2000 and 2001 is found near an elevation of 2,120 feet. A decline in nest sites at higher elevations in 2001 is possibly related to a change in vegetation condition and characteristics as vegetation dries out and as the distance from water increases. An increase in nest sites at lower elevations in 2001 is likely a response to newly established habitat closer to the lake.

Banding studies at Roosevelt and the San Pedro/Gila confluence areas estimated survivorship for 1999 to 2000 was 57 percent for returning banded flycatchers (Luff et al. 2000). Site fidelity for returning banded birds was 70 percent. For surviving flycatchers that did not return to the previous nesting site, several relocated within 15.5 miles, and one flycatcher moved about 43 miles. Along the lower Colorado River, flycatcher movement of 137 miles was recorded (McKernan and Braden 2001). Other flycatcher relocations in Arizona from 43 to 90 miles have been observed (Sogge, pers. comm. 2001; Paxton, pers. comm. 2002).

#### **4.6.1.2 Yuma Clapper Rail**

**Distribution and Status.** The Yuma clapper rail is a water bird. It is one of the smaller clapper rail subspecies with a laterally compressed body, long legs, and a short tail (ESIS 1998). Males are 8 to 9 inches tall and females are slightly smaller. The clapper rail has an orange-colored beak that is long, slender, and curved downward slightly. Anteriorly, coloration is a mottled brown on a gray background. Its flanks and underside are dark gray with narrow vertical white stripes that produce a barred effect, with a subdued burnt-orange breast. Males and females are alike in plumage coloration.

Historically, this subspecies of clapper rail occurred in the marshes of the Lower Colorado River and its tributaries in Mexico and the United States. A large number of clapper rails continue to be found on the Colorado River delta in Mexico. In the United States, they are currently found primarily along the Colorado River from Lake Mead to Mexico (Yuma, La Paz, and Mohave counties, Arizona); at the Salton Sea (California); in the lower Gila River watershed west of Phoenix and at Picacho Reservoir (Maricopa and Pinal counties, Arizona) below elevation 4,500 feet. Clapper rails have been found as far north as the Virgin River in Utah (Tomlinson, pers. comm. 2002). As evidenced by its recent occurrence at Roosevelt, the clapper rail may be expanding into other suitable marsh habitats in western and central Arizona.

The clapper rail was listed as endangered in 1967 (32 FR 4001, March 11, 1967). No critical habitat has been designated (FWS 1993b, p. 67). A recovery plan was completed in 1983.<sup>46</sup> The clapper rail is listed as a species of special concern in Arizona (AGFD 1996 in prep.) FWS has scheduled the clapper rail for consideration of downlisting or delisting in 2005 (Fitzpatrick, pers. comm. 2002).

The clapper rail population in the United States appears stable, with about 500 to 1,100 birds surveyed annually at sites in the Lower Colorado River basin, including 9 to 55 birds identified on surveys along the Gila River west of Phoenix and at Picacho Reservoir south of Phoenix (FWS 1997d; FWS 2001d).

**Clapper Rail Breeding and Foraging Habitat.** Nesting behavior begins in February with nesting occurring from mid-March to early July, with most eggs hatching during the first week of June (FWS 1997d). There is no evidence of more than one brood per season. Young clapper rails experience high mortality from predators, usually within their first month of life. Surviving clapper rails of other subspecies fledge in 63 to 70 days.

Clapper rails typically occupy dense marshes with cattails or bulrushes, but may also be found in more sparse areas of marsh vegetation. Nest sites are located at the base of living clumps of cattail or bulrush, under wind thrown bulrush, or on the top of dead cattails remaining from the previous year's growth. Sometimes they weave nests in the forks of small shrubs that lie just above moist soil or above water that is up to two feet deep. Marsh areas with a mosaic of vegetation of different ages and patches of open water result in high productivity. Yuma clapper rails need small areas of high ground within the marsh mosaic for walking and foraging, and especially during the breeding season to prevent downy chicks from becoming saturated and drowning (ESIS 1998). Water levels in clapper rail habitat may be stable or vary as long as nests are not flooded (FWS 1997d). Average clapper rail territory and home range size at the Salton Sea was found to be about 1.2 acres (ESIS 1998). Other sources indicate a similar minimum patch size of about 1.2 to 2.5 acres (Todd 1986; Fitzpatrick, pers. comm., 2002). Crayfish comprise up to 95 percent of the clapper rail diet, which also includes insects, shrimp, clams, leeches, plant seeds, and small fish (FWS 1997d).

**Threats to the Species.** Loss of marsh habitat from river management activities such as channelization, dredging, bank stabilization, and fluctuating reservoir levels has reduced the habitat for clapper rails. However, impoundments along the Lower Colorado River and mitigation efforts in that area have increased the extent of backwater marshes in the reach between Davis and Laguna dams (FWS 1997d).

**Clapper Rail Habitat and Occurrence at Roosevelt Lake.** Prior to the recent sightings at Roosevelt, the closest clapper rail sightings were approximately 60 miles downstream on the Salt River near Granite Reef Dam. Rails have been observed off and on near Granite Reef between 1970 and 1985 depending on the availability of suitable habitat. No rails have been reported from the area between the confluence of the Salt and Verde rivers and the wetlands downstream of the diversion dam since 1985. Flood flows

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<sup>46</sup> See <http://ifw2es.fws.gov/Documents/R2ES/YumaClapperRail.pdf>.



in 1993 scoured potential clapper rail habitat downstream of the Salt-Verde river confluence” (Reclamation 1996b).

A single male clapper rail was confirmed at Roosevelt along Tonto Creek in May 2002 (Messing 2002b) near the Orange Peel campground (Figure 21). This is the first known sighting of this species at Roosevelt. This clapper rail was found in a strip of cattails about 20 to 60 feet wide by about 3,000 feet long with patches of standing water at an elevation of about 2,100 feet (Id.). Dense salt cedar borders the cattails along the western edge; the adjoining vegetation on the east side is a dense but narrow strip of willow and salt cedar with a gravel bar beyond (Spencer, pers. comm. 2002).

The only other potential clapper rail habitat found at Roosevelt during a helicopter survey in June 2002 was a smaller strip of cattails upstream from the Orange Peel marsh described above at an elevation just under 2,120 feet. This strip of marsh is currently not as suitable for clapper rails given the narrow width and lack of dense adjacent vegetation (Id.). Total potentially suitable Yuma clapper rail habitat in 2002 at Roosevelt is about 4 acres at the two locations on Tonto Creek.

#### **4.6.1.3 Bald Eagle**

**Distribution and Status.** Bald eagles are large birds of prey usually found along lakes, rivers, and seacoasts. Nests are generally located near water and are built high in trees, on cliffs, or on pinnacles with a broad overview. Bald eagles historically inhabited the lower 48 states and Alaska. As of 2002, about 46 known bald eagle breeding areas are located in Arizona and approximately 300 bald eagles winter throughout the state (AGFD in prep.) (Figure 17). The bald eagle was downlisted from endangered to threatened in 1995 (FWS 1995b), and is included as a species of special concern in Arizona (AGFD 1996 in prep.).

**Bald Eagle Breeding and Foraging Habitat.** Bald eagles nest and breed in central Arizona at elevations ranging from 1,080 feet to 5,640 feet. Eggs are laid between December and March, and the nestlings fledge at about 12 weeks of age, usually between April and June. Typical vegetation at eagle nest sites includes Arizona sycamore (*Platanus wrightii*), blue palo verde, cholla (*Opuntia* spp.), Fremont cottonwood, Goodding willow, mesquite, saguaro, and salt cedar, with piñon pine (*Pinus* spp.), juniper (*Juniperus* spp.), and other conifers occurring in some areas (Driscoll and Koloszar 2001). Bald eagles usually place their nests within 1 mile of a creek, lake, or river, although they have been known to nest farther from water occasionally (Driscoll and Koloszar 2001).

Nests often are built in the crotches of large trees or on cliffs or ledges and can measure up to 6.2 feet in diameter and 4 to 10 feet in depth (Stokes and Stokes 1989). Eagles also will build nests on artificial structures, including constructed nesting platforms (Grubb 1980). In Arizona, breeding pairs tend to stay in their breeding areas year-round, with some movement within the state during the summer. Their home range varies in size depending on the water system, diversity and abundance of food available, and the proximity of other breeding pairs (AGFD in prep.).

Bald eagles prey mainly on fish, but their diet can include waterfowl, small mammals, and carrion. The presence and diversity of fish species is an important component of

suitable breeding habitat for bald eagles in Arizona (Hunt et al. 1992). According to Hunt et al. (1992), native suckers are a crucial prey species during the breeding season. Native suckers are more resistant to drought conditions than non-native fish such as catfish, carp, and bass and persist in rivers and replenish their numbers quickly (Rinne and Minckley 1991; AGFD in prep.). The Bald Eagle Conservation Assessment and Strategy (AGFD in prep.) adds that “Most importantly, suckers are an accessible food source and spawn during the bald eagle’s breeding cycle.”

**Threats to the Species.** Bald eagles experienced significant reproductive failure caused by the use of DDT, which is now banned in the U.S. although it persists in the environment. Current threats are habitat loss, human encroachment on nest sites, entanglement in fishing line, reduction in fish populations, illegal shooting, and heavy metals (AGFD in prep.).

**Bald Eagle Habitat and Occurrence at Roosevelt Lake.** In 2001, six bald eagle breeding areas were located within about 15 miles of Roosevelt Lake and five of the nests were occupied. Eagles from these sites all use habitat at Roosevelt (Beatty, pers. comm. 2001). Cottonwood trees near Roosevelt provide perches for bald eagles to nest, roost, loaf, preen, and/or hunt (AGFD in prep.). Hunt et al. (1992) found that inflow areas are important foraging habitat for Arizona bald eagles and that free-flowing creeks, such as Tonto Creek, had the highest nest success rates.

Eagles from the Pinto Creek and Tonto Creek breeding areas are known to forage extensively over Roosevelt. The Pinal breeding area may also use habitat at Roosevelt, although they may be excluded during low lake levels by the Pinto eagles (Hunt et al. 1992). Eagles from the Dupont and possibly the Rock Creek breeding areas occasionally forage at Roosevelt (Hunt et al. 1992). There is no evidence the eagles from the Sheep breeding area are using Roosevelt Lake for foraging; they are located about 15 miles upstream of the mouth of Tonto Creek at Roosevelt (Beatty, pers. comm. 2001). The Pinto and Tonto Creek bald eagle breeding areas are closest to Roosevelt and cottonwood trees are used for nesting at these sites. The nest of the Pinal breeding area is located several miles up Pinal Creek on cliffs or pinnacles. The Dupont breeding area was found in 1997 in the Sierra Ancha Mountains, approximately 13 miles from Roosevelt Lake. This pair has nested in both live and dead ponderosa pines. A new Rock Creek eagle breeding area not shown in Figure 17 was located in 2001. The Rock Creek pair nests in a large ponderosa pine in the Four Peaks area about 6 miles from Roosevelt. Table 15 lists 12 years of nesting results for the six breeding areas in the Roosevelt Lake vicinity.

**Table 15. Occupancy and nesting results for bald eagles near Roosevelt Lake for the years 1991 to 2001.**

| Breeding Area | 1991  | 1992 | 1993  | 1994  | 1995  | 1996  | 1997  | 1998  | 1999  | 2000 | 2001  | 2002  |
|---------------|-------|------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| Pinal         | S (1) | F    | S (1) | S (1) | F     | F     | F     | O     | O     | F    | U     | S (1) |
| Pinto         | F     | F    | S (1) | F     | S (2) | S (3) | F     | O     | S (2) | O    | S (2) | F     |
| Sheep         | U     | O    | O     | F     | O     | S (2) | O     | O     | S (1) | F    | F     | S (2) |
| Tonto         |       | F    | S (2) | S (1) | S (1) | S (2) | S (2) | S (1) | S (2) | F    | S (1) | S (2) |
| Dupont        |       |      |       |       |       |       | F     | S (1) | O     | F    | O     | U     |
| Rock Creek    |       |      |       |       |       |       |       |       |       |      | O     | S (1) |

U = unoccupied, O = occupied, S = successful (number fledged), F = failed

*Source:* AGFD Arizona Bald Eagle Nestwatch Program reports (Driscoll et al. 1999; AGFD in prep.); 2001 data: Beatty, pers. comm. 2002; Driscoll, pers. comm. 2002.

The mature cottonwood trees in which the existing eagle nests at Pinto and Tonto Creek are located occupy the fringe of the historical maximum Roosevelt Lake level at elevations of about 2,125 to 2,135 feet (FWS 1990, p. 4; FWS 1993a, p. 19). The most important vegetation types for eagles in the Roosevelt area are mature cottonwood and willow trees that can potentially serve as nesting and perching sites for eagles. Cottonwoods and willows are present in the mixed riparian vegetation and are more common at higher elevations surrounding Roosevelt. However, most of the woody vegetation that currently occupies the reservoir bed is comprised of short dense salt cedar thickets or relatively sparse areas of various riparian species, which are unsuitable for eagle nesting and perching. Development of a mature cottonwood tree suitable for bald eagle nesting may take over 25 years.

There are about five bald eagle breeding areas located along the Salt River downstream from Roosevelt. Eagles at these sites nest in cliff faces rather than trees.



cuckoos were reported along 25 drainages throughout Arizona, mainly occurring below 4,921 feet. The authors reported 172 pairs and 81 unmated adults during 1999 surveys along 221 miles of riparian habitat (Figure 18). Cuckoos mainly were located along the San Pedro, Verde, and Agua Fria rivers, and Cienega and Sonoita Creeks (Corman and Magill 2000). The largest detection of cuckoos in Arizona during 1998 and 1999 surveys occurred at the San Pedro Riparian National Conservation Area. These survey numbers reflect surveys completed mainly on public lands and do not include work on many private or tribal lands, and therefore a statewide population estimate is not available at this time.

**Cuckoo Breeding and Foraging Habitat.** Cuckoos begin breeding in mid- to late May in central Arizona after over-wintering in South America (Ehrlich et al. 1988; AOU 1998). Nesting activities continue through August and often into September in the southeastern portion of the state (FWS 2001c; Corman and Magill 2000). The birds generally are found below 6,600 feet in elevation (FWS 2001b).

The cuckoo breeds in large blocks of riparian habitat, particularly in cottonwood and willow stands, which they also use extensively for foraging (Preble 1957; Ehrlich et al. 1988; Laymon 1999). Cuckoos eat insects, especially hairy caterpillars, grasshoppers and larvae, as well as small fruits and berries (Ehrlich et al. 1988). They have sometimes been known to eat small frogs, lizards, and occasionally the eggs of other birds (Alsop 2001). It is thought that nesting peaks around mid-June through August in response to the abundance of cicadas, katydids, caterpillars, and other large prey that form the bulk of their diet (Hamilton and Hamilton 1965).

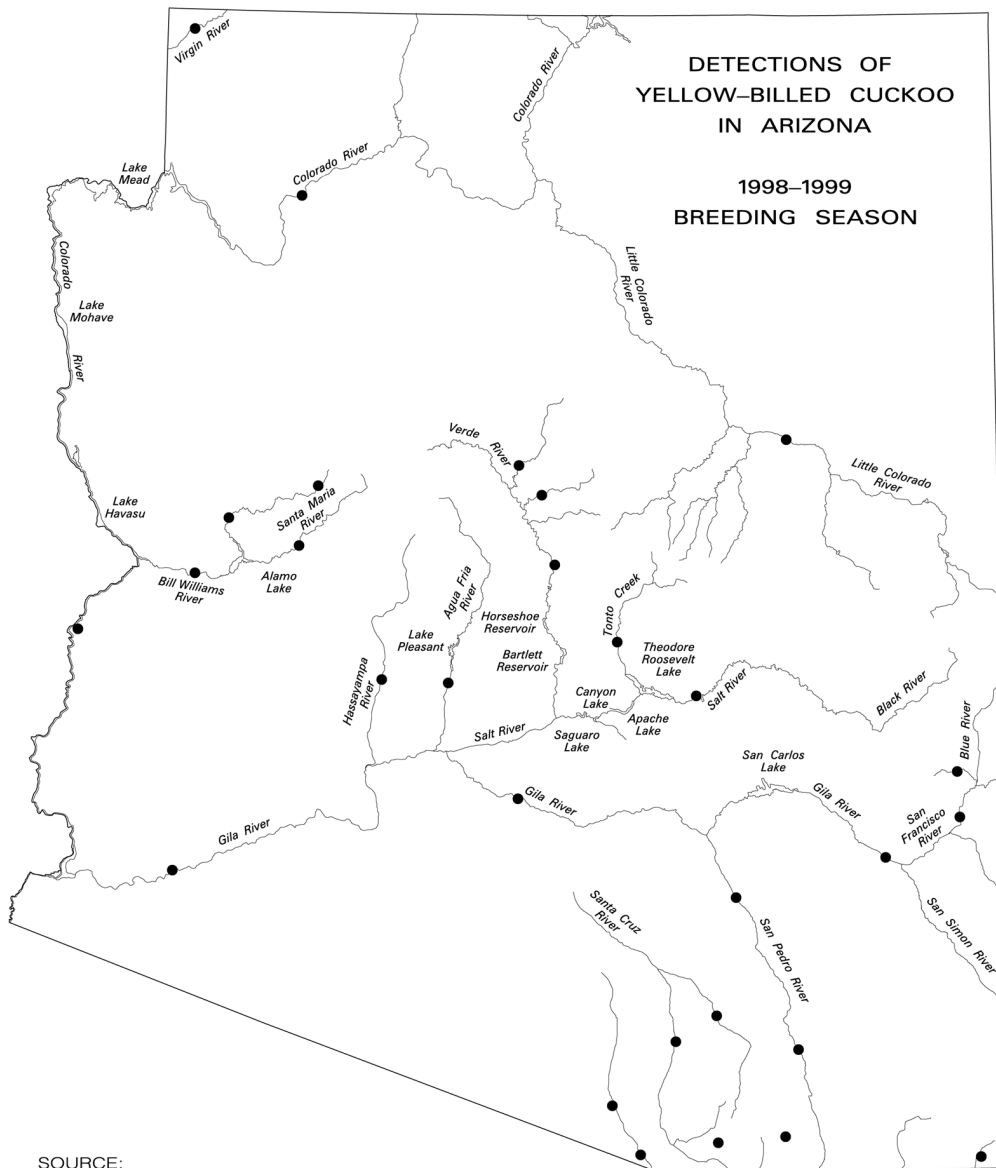
In Arizona, Corman and Magill (2000) reported cuckoo occupancy in six habitat types during breeding season (Table 16). Cuckoos prefer dense riparian habitat and most commonly occupied vegetation communities were cottonwood, willow, ash, and mesquite. Cuckoos have occasionally been found to nest and forage in stands with up to 50 percent salt cedar (Pima County 2001; Corman and Magill 2000; Halterman, pers. comm. 2002).

**Table 16. AGFD's cuckoo detections by habitat type during 1998-1999 surveys in Arizona by AGFD and USGS.**

| Vegetation Type                                  | Number of Sites Surveyed | Percent of Sites Occupied |
|--|--------------------------|---------------------------|
| Cottonwood, willow, ash, mesquite                | 58                       | 70.7                      |
| Sycamore, cottonwood                             | 39                       | 46.2                      |
| Cottonwood, willow, mesquite, < 75% salt cedar   | 28                       | 60.7                      |
| Sycamore, alder, cottonwood, willow, ash, walnut | 12                       | 33.3                      |
| Mesquite bosque, hackberry                       | 5                        | 60.0                      |
| > 75% salt cedar                                 | 3                        | 33.3                      |

Source: Corman and Magill 2000.

**Figure 18. Detections of Yellow-billed Cuckoo in Arizona, 1998 and 1999 Breeding Seasons.**



SOURCE:  
WESTERN YELLOW-BILLED CUCKOO  
IN ARIZONA - 1998 AND 1999 SURVEY  
REPORT ISSUED MARCH 2000 BY  
ARIZONA GAME AND FISH DEPARTMENT

In addition to vegetation characteristics, the size and shape of riparian patches are important characteristics of cuckoo habitat. On average, breeding cuckoo pairs require patches 25 to 100 acres in size. Laymon (1999) notes that patches on the Colorado River as small as 10 acres have been occupied by breeding pairs. Minimum cuckoo home ranges of 10 to 50 acres are likely depending on the quality of the habitat and other factors (Halterman pers. comm. 2002). The shape of riparian habitat patches also may be crucial. Cuckoos are thought to avoid habitat edges because of an increased risk of predation. Long, narrow areas have more edge in relation to the area of habitat, and would be considered less suitable. Desirable habitat strips are typically greater than 325 feet wide, and 1,950 feet is most favorable (Laymon 1998).

**Threats to the Species.** Factors contributing to the decline of cuckoos in the western U.S. include: degradation and loss of riparian habitat due to vegetation clearing, stream diversion, water management, agriculture, urbanization, over-grazing, and recreation (AGFD in prep.); modification and fragmentation of habitat (Franzreb 1987; Laymon and Halterman 1989; Hughes 1999); decreased water tables (Phillips et al. 1964); and possibly the use of pesticides (Gaines and Laymon 1984; Laymon and Halterman 1986; Rosenberg et al. 1991; Hughes 1999; Corman and Magill 2000). Estimates of riparian habitat losses range from 90 to 95 percent in Arizona, 90 percent in New Mexico, 90 to 99 percent in California, and over 70 percent nation-wide (FWS 2001b).

**Cuckoo Habitat and Occurrence at Roosevelt Lake.** Little information is available on cuckoo use and activity at Roosevelt. Incidental sightings of cuckoos were reported during 1995 and 1996 at the Tonto Creek inflow (Spencer, pers. comm. 2001). Surveys at Tonto Creek did not locate any cuckoos in 1998, but two pairs were recorded in 1999 (Corman and Magill 2000). Cuckoos surveys on the Salt River located one pair and one single adult during 1999 (the Salt River inflow was not surveyed during 1998). It is not known whether the small number of cuckoos detected was a result of survey coverage or low populations. Based on regional survey results, monotypic salt cedar sites appear to be the least preferred nesting locations (Corman and Magill 2000). No other formal surveys have been conducted at the inflows to Roosevelt Lake. Incidental sightings of cuckoos by the AGFD willow flycatcher field crew were reported for the Salt River inflow in 2001, but none were reported for the Tonto Creek inflow possibly due to the drying out of the cottonwood/willow stand they once occupied. (A. Smith, pers. comm. 2001). Cuckoos were reported at Roosevelt in 2002 as early as May 15 (Paxton, pers. comm. 2002).

Potentially suitable cuckoo habitat at Roosevelt was estimated using recent vegetation maps (ERO 2001). Potential cuckoo nesting and foraging habitat at Roosevelt includes patches of tall, dense, native riparian woodlands 10 acres or greater. The following criteria were used in quantifying potentially suitable cuckoo habitat at Roosevelt:

- Cottonwood/willow
- Mixed riparian > 15 feet
- Patches larger than 5 acres (that may expand to 10 acres or more)

Table 17 summarizes potential cuckoo habitat that was available at Roosevelt Reservoir in 2001. The amount of potentially suitable habitat is expected to vary as the lake level fluctuates and as vegetation grows or dries out.

**Table 17. Potentially suitable cuckoo habitat at Roosevelt in 2001.**

| <b>Salt River Arm</b>             | <b>Acres</b> |
|-----------------------------------|--------------|
| < 2,090 feet                      | 0            |
| 2,091 – 2,110 feet                | 60           |
| 2,111 – 2,136 feet                | 100          |
| > 2,136 feet                      | 7            |
| <i>Total Salt River Arm</i>       | 167          |
| <b>Tonto Creek Arm</b>            | <b>Acres</b> |
| < 2,110 feet                      | 0            |
| 2,111 – 2,136 feet                | 153          |
| > 2,136 feet                      | 34           |
| <i>Total Tonto Creek Arm</i>      | 187          |
| <b>Roosevelt Reservoir Totals</b> | <b>Acres</b> |
| <i>Total 2,091 – 2,110 feet</i>   | 60           |
| <i>Total 2,111 - 2,136 feet</i>   | 253          |
| <i>Total &gt; 2,136 feet</i>      | 41           |
| <b>Grand Total</b>                | 354          |

#### **4.6.1.5 Other Sensitive Wildlife Species of Concern**

Other wildlife species of concern that could potentially be found near Roosevelt were identified from AGFD's Heritage Data Management System (Table 18). Species of concern include federally listed threatened or endangered species, Forest Service and Bureau of Land Management Sensitive Species, and Wildlife of Special Concern in Arizona.

The longfin dace, desert sucker, and Sonora sucker have records of occurrence in the Roosevelt area. These three fish species are found in Tonto Creek and in small numbers in the Salt River below the old diversion dam just upstream from Roosevelt (Messing, pers. comm. 2002a). The Roosevelt area provides suitable habitat for several other aquatic and riparian species. Suitable habitat for the lowland leopard frog and possibly the Gila topminnow is present in portions of Tonto Creek upstream from Roosevelt. The lowland leopard frog has been found at Roosevelt, as well as numerous nearby drainages, as recently as 1995. However, it probably does not maintain breeding populations at Roosevelt, including the Salt River and Tonto Creek inlets due to the presence of exotic predators. Lowland leopard frogs in these areas are probably transients from adjacent lands.

The cactus ferruginous pygmy-owl occurs in a variety of habitats, including river bottom woodlands, mesquite bosques, desert scrub, and mesquite invaded desert



grasslands (FWS 1997c). Habitat that appears to be suitable for the owl exists in the desert scrub and riparian woodlands around Roosevelt Lake, but no comprehensive surveys have been conducted to determine its presence. However, the area is outside the known historic range of the species and the area around Roosevelt was not designated as critical habitat (Reclamation 1999, 63 FR 71 820, since remanded). The other upland species in Table 18 are not known to exist within the active conservation space at Roosevelt and are not dependent on riparian habitat.

**Table 18. Other sensitive wildlife and species of concern near Roosevelt.**

| Scientific Name                               | Common Name                  | Status* |      |     |      | Record of Occurrence in Project Area | Potential Habitat in Project Area |
|---|------------------------------|---------|------|-----|------|--------------------------------------|-----------------------------------|
|   |                              | ESA     | USFS | BLM | AGFD |                                      |                                   |
| <i>Agosia chrysogaster</i>                    | Longfin dace                 |         |      | S   |      | Yes                                  | ✓                                 |
| <i>Catostomus clarki</i>                      | Desert sucker                |         |      | S   |      | Yes                                  | ✓                                 |
| <i>Catostomus insignis</i>                    | Sonora sucker                |         |      | S   |      | Yes                                  | ✓                                 |
| <i>Gila robusta</i>                           | Roundtail chub               |         | S    |     | WC   | No                                   | ✓                                 |
| <i>Glaucidium brasilianum cactorum</i>        | Cactus ferruginous pygmy-owl | LE      |      |     | WC   | No                                   |                                   |
| <i>Gopherus agassizii</i>                     | Sonoran Desert tortoise      |         |      |     | WC   | Yes                                  | ✓                                 |
| <i>Myotis velifer</i>                         | Cave myotis                  |         |      | S   |      | No                                   |                                   |
| <i>Nyctinomops femorosaccus</i>               | Pocketed free-tailed bat     |         |      | S   |      | No                                   |                                   |
| <i>Phyllorhynchus browni lucidus</i>          | Maricopa leafnose snake      |         | S    |     |      | No                                   |                                   |
| <i>Poeciliopsis occidentalis occidentalis</i> | Gila topminnow               | LE      |      |     | WC   | No                                   | ✓                                 |
| <i>Rana yavapaiensis</i>                      | Lowland leopard frog         |         | S    |     | WC   | Yes                                  | ✓                                 |
| <i>Xantusia vigilis arizonae</i>              | Arizona night lizard         |         | S    |     |      | No                                   |                                   |

KEY: ESA: LE=Listed Endangered; USFS: S=Sensitive Species; BLM: S=Sensitive Species; AGFD: WC=Wildlife of Special Concern in Arizona

\*Categories are explained in Appendix A.

#### 4.6.1.6 Sensitive Plant Species of Concern

Five plant species of concern—all upland species—have potential for occurrence within 1 mile of the Salt River, Tonto Creek, or Roosevelt (AGFD 2001) (Table 19). None of these plants have suitable habitat within the area of influence for the operation of Roosevelt and are not discussed further.

**Table 19. Sensitive plant species of concern near Roosevelt.**

| Scientific Name          | Common Name                | Status |     |        | Potential Habitat Exists in the Project Area |
|--------------------------|----------------------------|--------|-----|--------|--|
|                          |                            | USFS   | BLM | AZ NPL |  |
| <i>Abutilon parishii</i> | Pima Indian mallow         | S      |     | SR     | No   |
| <i>Agave delamateri</i>  | Tonto basin agave          | S      |     | HS     | No   |
| <i>Agave murpheyi</i>    | Hohokam agave              | S      | S   | HS     | No   |
| <i>Mabrya acerfolia</i>  | Mapleleaf false snapdragon | S      |     |        | No   |
| <i>Perityle saxicola</i> | Fish Creek rock daisy      | S      |     |        | No   |

KEY: USFS: S=Sensitive Species; BLM: S=Sensitive Species; NPL (Arizona Native Plant Law [1993]): HS=Highly Safeguarded, no collection, SR=Salvage Restricted, collection with permit

\*Protection status categories are explained in Appendix A.

#### 4.6.2 Environmental Consequences

This section includes a description of the potential environmental effects on threatened, endangered, and sensitive species from implementation of the No Permit, Full Operation, and Re-operation alternatives. The approach for determination of effects is defined in this section and provides the scientific and analytical basis for the comparison of alternatives. The focus of the impacts discussion is on potential changes in riparian habitat used by flycatchers, as well as Yuma clapper rails, bald eagles, cuckoos and other species of concern, and the potential impacts to these species from alternative operational constraints at Roosevelt.

Potential impacts to listed and candidate species would primarily occur from effects on riparian habitat used by these species resulting from changes in Roosevelt water levels. No direct take of individual animals is expected for any of the alternatives. Effects to habitat used by flycatchers, Yuma clapper rails, bald eagles, and cuckoos would fluctuate annually depending on the amount and duration of inflows into the lake and reservoir operation. The specific future impacts to riparian habitat cannot be readily predicted because of the uncertainties in precipitation and runoff; however, average frequencies and duration can be predicted based on historical hydrologic patterns.

The following discussion provides an analysis of the impacts to federally listed, candidate, and species of concern for all alternatives. Additional information on the environmental impact analysis is included in the RHCP (SRP 2002c).

#### **4.6.2.1 *Impact to Flycatchers***

**Approach for Effects Assessment.** Determining the direct effects to flycatchers is difficult. Impacts do not occur as a single permanent event that can be precisely predicted or readily quantified. Impacts to flycatchers would occur through habitat modification or degradation caused by periodic inundation, desiccation, or changes in habitat characteristics over time. Direct impacts to flycatchers, their nests, or eggs are expected to be infrequent for the reasons described below. The quantity of physical take of individual flycatchers from future Roosevelt operations is uncertain for several reasons:

- Physical take of adult flycatchers is unlikely because the birds are mobile.
- Physical take of flycatcher eggs or unfledged young from direct inundation is unlikely because flycatchers generally arrive in Arizona in May and reservoir levels always peak in late April or early May and steadily decrease during the nesting season. However, prior inundation might result in tree fall, causing direct take during the breeding season.
- Any take of flycatchers would be a result of effects on breeding and nesting success, or other indirect impacts from not being able to nest in habitat that would otherwise exist at Roosevelt in the absence of refilling the reservoir. The magnitude and results of these indirect effects on individual flycatchers or flycatcher numbers are not possible to quantify, but the potential range of effects is described below.
- Future changes in population size are difficult to estimate because population dynamics, and the relationship between population size and area of suitable habitat are not well understood.

SRP and the FWS have agreed to the alternative of quantifying incidental take in terms of harm to acreage of occupied habitat because the level of anticipated incidental take of flycatchers at Roosevelt is uncertain. Because the amount, quality, and distribution of flycatcher habitat is expected to change with changes in lake levels, the impact analysis is based on an approach that estimates the maximum amount of occupied habitat in the future rather than just the existing (baseline) habitat in 2001. In this analysis, that impact is measured as the difference between the maximum amount of occupied habitat predicted during low reservoir levels and the minimum amount of habitat predicted after the reservoir fills.

Precise characterization of flycatcher habitat has eluded analysis to date (Sogge and Marshall 2000; McKernan and Braden 2001). No single comprehensive model has been developed that defines flycatcher habitat (FWS 2001b). In general, occupied flycatcher breeding habitat consists of nest trees, male-defended territory space, and adjacent areas used for feeding, dispersal, or as an environmental buffer (see Appendix D in FWS 2001b). The approach used to prepare this impact analysis is to evaluate the long-term dynamics of hydrologic conditions and riparian vegetation as they relate to habitat occupied by flycatchers. Hydrologic data, field surveys and mapping, flycatcher research data, and modeling were used to evaluate and quantify potential impacts to flycatcher habitat from alternative operation scenarios for Roosevelt Lake. The different modeling

efforts that were used in the identification of suitable habitat, in determining likely changes in riparian habitat over time, and in quantifying future occupied flycatcher habitat are described below.

*Reservoir Operation Model.* As previously discussed in the Water Resources section, the SRPSIM hydrologic model was used to simulate reservoir operations for each of the alternatives. Hydrologic data from the 1889 to 1994 period of record was used because it includes a wide range in precipitation and runoff and is the best available indication of long-term variations in reservoir inflows.

*Vegetation Model.* A vegetation model was also developed to simulate cycles of vegetation growth and inundation based on reservoir levels over time. This model estimates the total amount of tall dense vegetation that may be present at any given time by focusing on the length of time that increments of Roosevelt are exposed or inundated. Several key assumptions were used in developing the vegetation model:

- **Historical inflows reflect future flows**—The 1889 to 1994 period of record is representative of the long-term pattern of precipitation and runoff. The future percentages of time that the reservoir levels affect tall dense vegetation at Roosevelt is expected to be similar to historical percentages of time.
- **Vegetation growth and inundation**—Exposure of the lakebed for five continuous years is assumed to allow tall dense vegetation to grow at that elevation; inundation for three continuous months (young vegetation) or 12 months (tall dense vegetation) is assumed to result in the death or degradation of the vegetation at that elevation. However, three months of inundation may stimulate growth of some woody vegetation such as willows.
- **Vegetation decadence**—Because of insufficient available information, the vegetation model does not address vegetation decadence as riparian habitat dries out following reservoir drawdown. As the reservoir recedes and ground water drops, some of the tall dense vegetation is expected to begin to die unless replenished by periodically higher reservoir levels.
- **Distribution of vegetation**—The future distribution of tall dense vegetation is assumed to be similar to current conditions although, over the long term, factors such as sediment deposition, scouring, hydrologic conditions or other natural events may affect the actual distribution of vegetation.

*Flycatcher Nesting Model.* A flycatcher nesting model was developed based on the hydrologic and vegetation model. This model examines reservoir elevation at the beginning of the nesting season to determine if vegetation may be suitable for nesting in a particular year. The model also is used to predict the amount of vegetation available for nesting. The primary assumption used in the flycatcher nesting model was:

- Vegetation for nesting is considered available if the tall dense vegetation is alive and not recovering from inundation and if inundated, is not inundated by more than 10 feet from the base of the tree on May 1. This is based on the normal decline in reservoir elevations after May 1 and, thus, when nesting activity begins in early June at the reservoir, inundation of vegetation would be about 6 to 8 feet

in comparison to nest height, which is typically 10 to 16 feet above the ground.

*AGFD Model.* AGFD developed a multi-scaled model to map and rank potential flycatcher breeding habitat in Arizona in order to prioritize surveys and to detect changes in habitat over time (Hatten and Paradzick, cited with permission, 2001). Although the model was not developed to analyze impacts to flycatcher habitat, it provides a reasonable estimate of habitat needed by adult and juvenile flycatchers for refuge, dispersal, and foraging near nests and territories (Hatten and Paradzick 2001; McCarthey et al., pers. comm. 2002).

The habitat components of the model that are the most highly correlated with breeding activity included: 1) the vegetation density immediately surrounding the nest (0.22 acres); 2) the vegetation density and characteristics within the broader 11.1-acre (394-foot radius) neighborhood of an observed breeding area; and 3) the amount of floodplain within an area of about 100 acres surrounding the site.

The model also substantiated field observations that breeding site acreage declined by about 20 percent between 1999 and 2001 as the reservoir receded and tall dense vegetation more distant from water began to dry out or became less desirable for flycatcher nesting because of the distance from open water (Hatten, pers. comm. 2001). Flycatcher use has shifted to new habitat and lower elevations in the lakebed, but they continue to occupy mature patches of habitat in the upper portions of the reservoir.

**Environmental Baseline for Flycatchers.** The environmental baseline is “the past and present impacts of all Federal, State or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process” (50 CFR §402.02). Incidental take of flycatchers at Roosevelt has been previously consulted on by Reclamation during the construction of Modified Roosevelt Dam in 1996 (FWS 1996). The consultation involved the indirect effect on flycatchers of higher reservoir levels from dam construction.

In 1993, southwestern willow flycatchers were discovered nesting at the reservoir and the species was listed as endangered in 1995. Reclamation requested Section 7 consultation with FWS in 1995 for the effect of modifications to Roosevelt Dam on flycatchers. The Biological Assessment prepared by Reclamation addressed the impact of the increased height of the dam, and the effects of the inundation of the additional reservoir space on flycatcher habitat. The 1996 BO issued by FWS addressed impacts to flycatchers and the annual incidental take of up to 90 birds. The BO identified an RPA that would avoid jeopardy to the species. The RPA and its status is listed in Chapter 2. Two of the most important components of the RPA with respect to mitigation of impacts in the RHCP are:

- **RPA 1.b. Flycatcher Habitat Protection** — Acquisition and maintenance of habitat on the San Pedro River; and

- **RPA 1.c. \$1.25M Management Fund** — All or nearly all of the fund will be used for land acquisition and habitat improvements along the San Pedro River.

Reclamation subsequently acquired 865 acres encompassing habitat, irrigated land (since retired) and ponds (all but one of which have been retired), and other land along the lower San Pedro River and is pursuing the acquisition of other land along the river.

The RHCP (SRP 2002c) addresses all of the current and future flycatcher habitat at Roosevelt that could be affected by SRP operations including areas currently occupied by flycatchers that were addressed in the 1996 BO and are therefore part of the environmental baseline. Rather than trying to exclude these areas or those flycatchers from the analysis, the mitigation resulting from that BO is subtracted from the total mitigation considered under this analysis.

**Critical Habitat for Flycatchers.** Critical habitat was designated for flycatchers in 1997 but was set aside in 2001 due to a court ruling that the economic analysis incorporated in the designation needs reassessment. In the 1997 rule, Roosevelt and the immediate vicinity were not considered to be critical habitat (FWS 1997a). Given that critical habitat was not designated at Roosevelt in 1997 and the set-aside of the designation in 2001, there would be no effect on critical habitat from any of the alternatives considered, or from the minimization and mitigation measures required by RHCP at this time.

If critical habitat at or near Roosevelt is designated in the future for flycatchers, it would not affect the RHCP. Above elevation 2,151 feet, reservoir operations would not affect critical habitat. Below elevation 2,151 feet, the effects of reservoir operations on flycatcher habitat are being fully addressed by the RHCP.

#### **Effects of No Permit Alternative.**

*Impact on Flycatcher Habitat.* The No Permit alternative restricts the storage of water at Roosevelt to an elevation no greater than 2,095 feet under normal operations. The No Permit alternative is likely to have an adverse long-term impact on flycatchers by reducing the amount of riparian habitat available. Limiting Roosevelt lake levels to a maximum elevation of 2,095 feet would likely result in less flycatcher habitat over the long term at Roosevelt than current conditions. Occasional inundation of vegetation for short periods of time would occur because of physical constraints in Roosevelt dam and spillway that limit the volume of spills. Depending on the frequency and timing, occasional inundations may help to support some riparian vegetation above elevation 2,095 feet.

Currently the upper elevations of the lakebed are drying out and the overall amount of tall dense vegetation in the upper portions of the reservoir that is suitable for flycatcher occupation is likely to decrease as the vegetation decays and loses structural characteristics necessary for flycatcher use. If the maximum level of the reservoir is restricted to elevation 2,095 feet, much of the existing tall dense vegetation above that elevation would be expected to degrade as suitable habitat for flycatchers (Figure 14). The exception would be areas along the Salt River and Tonto Creek where bands of riparian vegetation would develop along the riverine floodplain. The riparian vegetation

along the Salt River and Tonto Creek above elevation 2,095 feet would undergo the typical cycle of scouring and regrowth experienced along other rivers in the Southwest. The effect of frequent reservoir fills would be to restrict the growth of tall dense riparian vegetation to a band on the inflow deltas near the high-water mark at elevation 2,095 feet. In these areas, tall dense salt cedar is likely to persist between about elevation 2,080 and 2,110 feet and mixed riparian vegetation may persist at between elevation 2,080 and 2,100 feet. It is not possible to accurately estimate the amount of habitat that would be located in the “bathtub ring” near elevation 2,095 feet but it is likely to be significantly less than the amount of habitat created and maintained by reservoir dynamics associated with the Full Operation and Re-operation alternatives.

*Impacts to Flycatcher Productivity.* The loss of habitat could displace flycatchers from existing breeding sites as the vegetation decays and loses the structural characteristics required for nesting. It is possible that flycatcher densities would increase to utilize the remaining habitat near an elevation of 2,095 feet. The composition, structure, and species composition of vegetation near Roosevelt on the inflow deltas is likely to change from pioneer species that invade frequently disturbed areas (preferred by flycatchers) to a riparian forest, with perhaps a greater composition of cottonwoods, sycamores, and larger riparian trees. A reduction in breeding habitat over the long term could affect the adult flycatcher mortality rate, nesting success, and survivorship of fledglings. Changes in flycatcher immigration/emigration are possible as flycatcher populations adapt to changes in riparian vegetation. A decline in the regional flycatcher population is possible if the amount of occupied habitat at Roosevelt permanently declines. A long-term reduction in occupied habitat could fragment the regional flycatcher population and reduce the amount of genetic exchange.

*Offsite Flycatcher Impacts.* Maintenance of a lower lake level at Roosevelt would result in additional reservoir releases from Salt River dams and increased potential for scouring of riparian vegetation during flood events when water that normally would be stored in the reservoirs. However, currently there are no known active flycatcher breeding areas below Salt River dams. A decrease in maximum spills from Verde River reservoirs would reduce the potential for scouring flows, but these flows are often beneficial in creating new riparian habitat. Recently, flycatchers have been observed on the Verde River inlet to Horseshoe Reservoir in trees with a base elevation of 1,997 feet, which is below the maximum storage capacity of 2,026 feet. On average, water levels at Horseshoe under the No Action alternative would be about 1,984 feet at the beginning of May, which is about 6 feet higher than under current conditions with the Full Operation alternative. By the first of June, reservoir elevations on average (1,978 feet) would be the same for No Permit and Full Operation alternatives. Effects to existing riparian vegetation used by flycatchers at Horseshoe Reservoir are possible from scouring flows or periodic inundation or dry out similar to potential effects at Roosevelt. The beneficial or adverse effects of the No Permit alternative on flycatchers at Horseshoe are difficult to predict because of the variability in runoff and storage volumes from year to year.

*Conservation Measures for Flycatchers.* No new conservation measures would be implemented under the No Action alternative. Roosevelt would be operated to avoid the incidental take of flycatchers and impacts to the existing suitable riparian habitat. The

amount of flycatcher habitat and flycatcher breeding activity at Roosevelt would vary according to the quality and quantity of habitat created by maintaining a lower lake level. No new habitat acquisition or protection measures would be implemented. Mitigation measures required under the BO for Modified Roosevelt may no longer be necessary and further implementation may be suspended.

**Effects of Full Operation Alternative (Proposed Action).**

*Impact on Flycatcher Habitat.* The continued operation of Roosevelt is likely to result in impacts to listed species that constitute a take under the ESA. The amount of riparian habitat affected by Full Operation of Roosevelt would vary in the dynamic system created by Roosevelt; as reservoir levels rise or recede, the amount and location of suitable habitat would change. Continued operation of the lake is expected to result in the long-term existence of varying amounts of habitat suitable for flycatchers in the future, similar to past operation.

Various approaches were evaluated to estimate the amount of habitat occupied by flycatchers at Roosevelt.<sup>47</sup> Two meetings were held with Arizona biologists active in flycatcher research and management to discuss methods to quantify future occupied habitat.<sup>48</sup> The consensus was that the amount of habitat used by flycatchers at Roosevelt was larger than the area defended as territories. In January 2002, discussions with AGFD and FWS flycatcher biologists led to the selection of the 11.1-acre neighborhood (394-foot radius around nest sites), as the best available estimate of occupied habitat (McCarthy et al., pers. comm. 2002).

The existing area of occupied flycatcher habitat includes the 394-foot buffer around each nest within the tall dense vegetation found in the Salt River and Tonto Creek area of Roosevelt Lake (Figure 12 and Figure 13). In order to estimate the maximum amount of future habitat that might be occupied by flycatchers at Roosevelt, the 1995 to 2001 trend of occupied habitat was extrapolated using two curves fitted to the historical data. Projections of occupied habitat were extrapolated to 2004. Two curves were fitted to the historical data to estimate the future trend of occupied habitat, using second order and third order polynomial equations to establish the probable outer limits of occupied habitat (Figure 19).<sup>49</sup> Both curves fit the data well with correlation coefficients of 0.97 and 0.98 for the second and third order equations, respectively. The second order equation is

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<sup>47</sup> The focus on occupied habitat is based on the definition of harm, which “may include significant habitat modification or degradation where it actually kills or injures wildlife...” 50 C.F.R. § 17.3 (emphasis added, see *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 115 S. Ct. 2407).

<sup>48</sup> These meetings were held at FWS offices on November 27 and December 17, 2001. Attendees included: Tracy McCarthy, Jim Hatten, Chuck Paradzick and Alex Smith, AGFD; Sherry Barrett, Greg Beatty and Jim Rorabaugh, FWS; Henry Messing and Susan Sferra, Reclamation; Mark Sogge and Eben Paxton, USGS; Scott Mills, SWCA; Steve Dougherty and Craig Sommers, ERO; and Janine Spencer, consulting biologist to SRP.

<sup>49</sup> The 2nd order equation is  $\text{Acres} = 5.41(\text{year})^2 + 27.95(\text{year}) + 56.05$ . The 3rd order equation is  $\text{Acres} = 1.85(\text{year})^3 + 27.64(\text{year})^2 + 48.02(\text{year}) + 122.75$ .



based on the assumption that habitat is not a limiting factor and represents a simple population growth curve typical of early colonization of empty habitats (McCallum 2000). The third order equation reflects a logistic growth pattern where population growth is constrained at some point by a lack of habitat or some other factor (Id.). The trend in habitat quantity and quality at Roosevelt is not clear, but there appears to be potentially suitable habitat that is unoccupied.

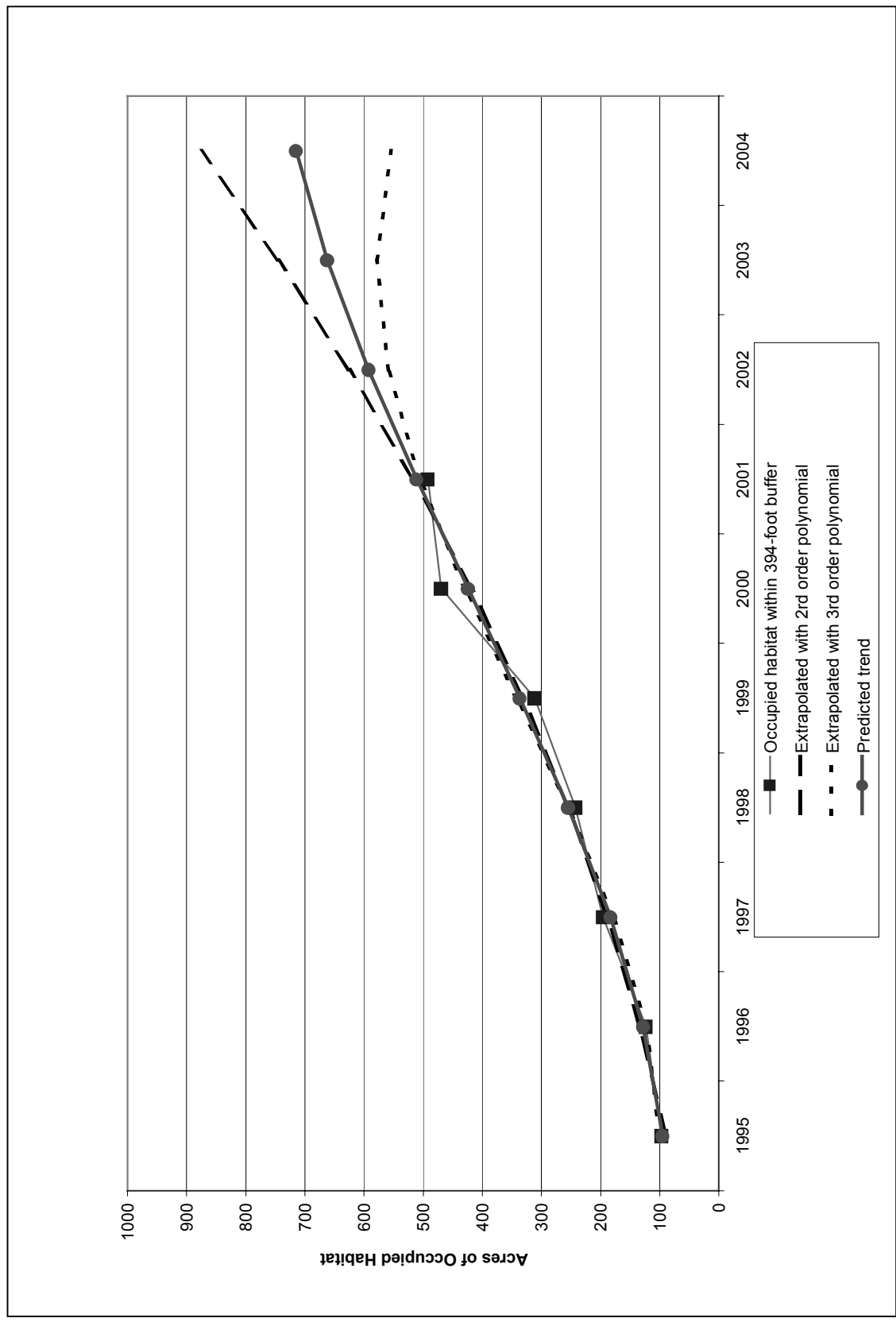
The assumption that habitat is currently a limiting factor at Roosevelt is not well supported. On the other hand, unexplained variation in model results (likely caused by demographic and environmental variables not included in the model) and population growth trends in other animal populations indicate that constant exponential growth is unlikely. Therefore, the most probable trend of occupied habitat lies somewhere between the two curves, which define the likely limits of habitat. Based on the trend in occupied habitat, recent observations, and modeling of long-term conditions, the maximum amount of habitat predicted to be occupied in the future with full operations at Roosevelt is estimated to be less than 750 acres as shown by the solid line in Figure 19.

A precise determination of the maximum amount of future impact to flycatcher habitat is difficult. Future hydrological conditions, changes in population dynamics, or other factors could possibly combine to result in greater or lesser quantities of occupied habitat at Roosevelt.

*Impacts on Flycatcher Productivity at Roosevelt.* High lake levels during periods of abundant precipitation may reduce flycatcher productivity by inundating habitat. The temporary loss of nesting habitat during periods of habitat inundation may result in site abandonment or delayed breeding by flycatchers. Short-lived species such as the flycatcher are vulnerable to short-term adverse effects, such as the loss of reproduction during one or more years. The result would be reduced recruitment into the population region-wide in subsequent years and the accompanying loss of reproduction from birds returning to breed for their first time after hatching. There is a possibility that the Roosevelt population may not be able to sustain itself without immigration from other populations; however, immigration and productivity at Roosevelt is likely to continue in the future as it has recently when habitat is available.

Flycatchers depend on riparian areas for carrying out their life cycle. Destruction of riparian vegetation directly reduces the capacity of an area to support flycatchers. Habitat loss, modification, and fragmentation are believed to be the primary factors involved in the decline of the flycatcher (FWS 1993b, 1995a). A reduction in habitat reduces the total number of individuals that can occur at a particular location or throughout a region. Some flycatchers may successfully relocate to other areas of suitable habitat when the riparian habitat at Roosevelt is inundated, but the periodic loss of habitat, low amount of suitable habitat available nearby, and regional fragmentation may reduce the size of a viable population of flycatchers at Roosevelt.

Figure 19. Acres of Occupied Flycatcher Habitat Extrapolated to 2004.



Riparian habitat in the Southwest is naturally rare and patchy, occurring as widely separated ribbons of forest within a primarily arid landscape. In Arizona, riparian habitat comprises less than 0.5 percent of the landscape (Strong and Bock 1990). The actual extent of suitable habitat for flycatchers is much more restricted. Wide-ranging or highly mobile species that rely on naturally patchy habitats, such as the flycatcher, persist at regional scales as metapopulation, or local breeding groups that are linked together and maintained over time by immigration and emigration (Pulliam and Dunning 1994). Persistence of local breeding groups is a function of the number of individuals and the ability of individuals to disperse from one breeding location to the next. Fragmentation reduces the chance of an individual to successfully find suitable habitat. Searching for increasingly isolated patches leaves individuals vulnerable to mortality from competition, starvation, or predation and can lead to a loss of breeding opportunities.

Habitat loss and fragmentation combine to isolate and reduce in number and size the spaces necessary for breeding, feeding, sheltering, and migrating, and reduces the viability of a metapopulation or the species as a whole. A loss in suitable flycatcher habitat at Roosevelt Lake would increase population/habitat fragmentation. Displaced flycatchers may disperse to other breeding sites, including the Verde River, Gila River, and San Pedro River. The degree to which the Roosevelt population interacts through dispersal, immigration, or emigration with populations on the San Pedro River, Verde River, or other population in Arizona is not well understood. However, banding studies have indicated movement between these population centers, as would be expected in a species adapted to habitats susceptible of disturbance (FWS 2001b). Given its size and evidence of some immigration and emigration, the Roosevelt flycatcher population plays a role in regional population dynamics and maintenance of genetic diversity.

Given the flycatcher's status, modifying or eliminating the habitat of an established large population during the breeding season in some years would likely result in delayed or lost breeding attempts, decreased productivity and survivorship of adults that disperse in search of suitable breeding habitat, and decreased productivity of adults that attempt to breed at Roosevelt. Reducing adult productivity and survivorship over the long term, or eliminating both in the short term, may periodically result in partial or complete loss of productivity from up to about 40 percent of the flycatcher territories documented in Arizona. Ultimately, periodic partial or complete loss of the Roosevelt Lake breeding population may affect flycatcher populations regionwide by increasing isolation/fragmentation of habitats and populations, reducing immigration/emigration rates and potentially changing patterns of source and sink populations, and reducing genetic exchange.

At current levels of flycatcher density at Roosevelt, about 400 birds would occupy the 750 acres of maximum predicted habitat and would be affected by a complete refill of the reservoir in that situation. If circumstances change and occupied habitat increased to 1,250 acres, about 640 birds would be present at current densities and would be affected by filling the lake to elevation 2,151. At higher or lower densities, the number of birds occupying a given amount of habitat would vary above or below the numbers of birds listed above. Similarly, the amount of occupied habitat affected by higher reservoir levels would vary from a few acres to all of the occupied acres depending on the extent of

habitat that has developed, the relative amount of habitat occupied by birds, and the degree of refill in a particular year. The longer the period of low reservoir levels that precede a refill, and the larger the refill event, the more occupied habitat that is likely to be harmed. Based on historical hydrology, the predicted frequency of inundation following extended dry periods, which may result in impacts to flycatcher habitat, include near or complete fill twice and potential fill three times in 50 years.

*Offsite Impacts.* When habitat is inundated at Roosevelt, flycatchers are likely to disperse to other areas, increasing flycatcher populations at other regional sites.

*Conservation Measures for Flycatchers.* As discussed in the description of the Full Operations alternative in Chapter 2, conservation measures were developed in the RHCP to reduce the potential effect of continued reservoir operations on flycatchers and their habitat.

Habitat Acquisition and Protection. One component of the mitigation encompassed in the RHCP is to acquire and manage at least 1,500 acres of riparian habitat through fee title or easement of currently occupied flycatcher habitat, or habitat that through improved management is expected to support flycatchers in the future. This is double the anticipated impact of up to 750 acres of flycatcher habitat.

Existing mitigation resulting from the construction of Modified Roosevelt Dam was subtracted from the mitigation requirements because it is part of the environmental baseline for the impact analysis. The San Pedro Preserve, which was purchased by Reclamation as pursuant to RPA in the BO for the construction of Modified Roosevelt, contains about 400 acres of riparian habitat (primarily cottonwood/willow habitat) suitable for flycatchers (SRP 2002c). Reclamation is pursuing additional mitigation properties with the remainder of the management fund established under the RPA. Reclamation estimates that it should be able to acquire about 200 acres of additional riparian complex (primarily cottonwood/willow habitat) with these remaining funds (Sferra, pers. comm. 2001). Subtracting the existing 400 acres that would be acquired by Reclamation and an additional 200 acres after acquisition of additional habitat, from the mitigation requirement of 1,500 acres results in 900 acres to be acquired and managed by the RHCP.

The RHCP includes measures to create up to 20 acres or more of riparian habitat on the Salt arm of Roosevelt, to acquire up to 120 acres of suitable flycatcher habitat on the Verde River and 760 acres on the San Pedro River, and to acquire additional habitat elsewhere if needed. In addition, the RHCP includes management and protection of riparian habitat at Roosevelt and all mitigation sites, ongoing monitoring of flycatcher populations at Roosevelt and mitigation sites, and acquisition of water rights with conservation of each mitigation site to maintain riparian habitat.

Because it is not possible to estimate the amount of additional occupied habitat that might be affected above the maximum predicted level of 750 acres, adaptive management would be employed to address such increases if they occur. Adaptive management would be implemented if monitoring shows that acres of occupied flycatcher habitat lost exceeds 750 acres. If monitoring of occupied habitat loss demonstrates more than 750 acres have been lost, or predictive modeling indicates more than 750 acres would be lost

in an inundation event, SRP would develop and implement additional mitigation within 3 years to address impact for up to an additional 500 acres of lost occupied habitat. The additional 500 acres would be mitigated at a 2:1 ratio, resulting in the protection of up to an additional 1,000 acres of flycatcher habitat, plus up to 500 acres worth of additional conservation measures. If more than a total of 1,250 acres are lost or predicted to be lost, a permit amendment would be necessary.

Additional Conservation Measures. In addition to the habitat acquisition and management described above, the RHCP provides for additional conservation measures equivalent to 750 acres. These additional measures may take a variety of forms, including:

- Protection and management of riparian habitat at Roosevelt;
- Protection and management of appropriate, feasible upland buffers to reduce effects of adjacent land uses on riparian habitat;
- Acquisition of water rights and reduced diversion or ground water pumping, with concomitant benefits to protected riparian habitat; and
- Other measures approved by FWS.

The additional measures of habitat protection, cessation/reduction of diversions or ground water pumping, and associated management would be provided in perpetuity. Funding would be provided in perpetuity for management, maintenance, and required monitoring of riparian habitats and flycatcher occupancy.

Credit for management assistance at Roosevelt would be based on the proportion of management funding provided by SRP in relation to the total cost of acquisition or protection and management of the land. At Roosevelt, SRP's funding of management personnel would be divided by the average cost of acquisition or protection and management of riparian land along the San Pedro River to determine the number of acres of long-term Roosevelt habitat to be credited under Additional Measures.

Credit for upland buffers would be agreed upon by FWS and SRP on a case-by-case basis. The actual amount may vary from site to site depending on surrounding land use and habitat characteristics and other local factors.

Credit for acquisition of water rights and reduced diversion or ground water pumping would be based on the historic depletion of water by the irrigation or other uses in AF per acre divided by 2 AF per acre for the average depletion of moderate to dense riparian vegetation. As part of the mitigation for construction of Modified Roosevelt, Reclamation retired about 164 acres of irrigated land and ponds on the San Pedro Preserve, which consumed approximately 440 AF of water per year. The equivalent mitigation credit is 220 acres, which is subtracted from the total of 750 acres of additional conservation measures.

*Summary.* Implementation of the Full Operation alternative is expected to temporarily and periodically remove up to 750 acres of occupied flycatcher habitat at Roosevelt Lake. Mitigation measures are provided for unanticipated impacts up to 1,250 acres of occupied habitat. The reduced survivorship and productivity of individuals from

a decrease in habitat is uncertain. Implementation of the proposed RHCP, including habitat creation, acquisition, protection, and management and monitoring measures, is expected to minimize and mitigate the potential impact to flycatchers and their habitat.

#### **Effects of Re-operation Alternative.**

*Impacts on Flycatcher Habitat.* The Re-operation alternative restricts the storage of water at Roosevelt to an elevation no greater than 2,125 feet under normal operations. The Re-operation alternative would affect the amount of existing riparian habitat available for flycatchers at Roosevelt. About 30 percent of the existing occupied flycatcher habitat is located at an elevation where the root crown is below an elevation of 2,115 feet and would be subject to periodic inundation. Thus, the Re-operation alternative would impact about 250 acres of currently occupied habitat. Additional existing habitat above 2,125 feet elevation is likely to decay with a lower reservoir level. Periodic reservoir fill after an extended period of drawdown would inundate habitat occupied by flycatchers, similar to existing conditions.

*Impacts on Flycatcher Productivity.* Potential impacts to flycatchers from the loss of habitat include displacement from breeding sites, higher adult mortality rates, delayed breeding, reduced nesting success, and lower survivorship of fledglings. There may be a decrease in the breeding population of flycatchers that help maintain other regional populations through emigration. A loss of habitat and the reduction in population would also result in a reduction in the genetic exchange.

*Offsite Impacts.* Potential impacts to suitable but unoccupied flycatcher habitat on the Salt River below Roosevelt is possible from additional spills during flood events. Increased Salt River maximum annual spills can serve to scour and create riparian habitat. A decrease in average and maximum spills below Verde reservoirs would reduce the potential for scouring and the disturbance needed for habitat creation. The beneficial or adverse effects associated with flood flows depend on the volume and timing.

The riparian habitat at the Horseshoe Reservoir inlet recently occupied by flycatchers could be affected by changes in Horseshoe operation in response to Roosevelt re-operation. On average, first of May reservoir levels at Horseshoe would be only one-foot lower than under the Full Operations alternative, but would be about 5-feet lower by the beginning of June. This would be about 24 feet below the base of the existing flycatcher nest trees. Actual impacts to development of riparian habitat at the Horseshoe inlet would vary from year to year and is likely to result in periodic inundation, drying, and scouring of riparian habitat suitable for flycatchers, so it is difficult to estimate the significance of impacts to existing flycatcher habitat.

*Conservation Measures for Flycatchers.* Conservation measures to minimize the impact on flycatchers would be similar to those for the Full Operation alternative. The amount of acreage that would be protected or enhanced as mitigation is based on a 3:1 replacement of the predicted impact of 250 acres. Thus, 750 acres of riparian habitat suitable for flycatcher use would be protected or other equivalent conservation measures implemented. Ongoing acquisition of about 600 acres of habitat by Reclamation for the impacts associated with the construction of Modified Roosevelt Dam would be subtracted because it is part of the environmental baseline for this analysis of impact. In addition,

Reclamation has acquired water rights equivalent to 220 acres of additional conservation. Therefore, Reclamation mitigation measures (820 acres) would completely satisfy the mitigation requirement for the Re-operation alternative.

Adaptive management of up to 500 acres of additional impact would be implemented if necessary. Replacement of affected riparian habitat at a 3:1 ratio would result in up to an additional 1,500 acres of habitat acquisition and management, and additional conservation measures. SRP would be responsible for implementing conservation measures in order to minimize and mitigate that impact.

#### **4.6.2.2 Impact on Yuma Clapper Rails**

**Approach for Effects Assessment.** Determination of potential effects to Yuma clapper rail is difficult because of the limited information on their use of Roosevelt Lake. Although an individual Yuma clapper rail was recently confirmed (May 2002) along the Tonto Creek inflow in a cattail marsh, there are no previous records of occurrence or breeding. The number of individual Yuma clapper rails that might be periodically lost due to future Roosevelt operations is uncertain for several reasons:

- The future population size is difficult to estimate because Yuma clapper rails are not known to have been present at Roosevelt before 2002.
- Direct loss of adult Yuma clapper rails is unlikely because the birds are mobile.
- Potential direct loss of Yuma clapper rail eggs or unfledged young is uncertain because the timing of nesting, if any, at Roosevelt is unknown.
- Additional habitat would be established for Yuma clapper rails near Roosevelt as part of the RHCP; however, there is uncertainty in the degree of future utilization of this habitat by these birds.
- The primary loss of Yuma clapper rails would be a result of effects on breeding success, nesting success, fecundity, or other indirect impacts from not being able to utilize habitat that would otherwise exist at Roosevelt in the absence of refill of the reservoir. The magnitude and results of these indirect effects are not possible to accurately quantify.

Given that the direct loss of Yuma clapper rails at Roosevelt is uncertain, potential effects are quantified in terms of impacts on potentially occupied habitat. Potential impacts to Yuma clapper rail habitat are possible from inundation, scouring, or other changes in hydrology that affect cattail marsh habitat preferred by Yuma clapper rails.

**Environmental Baseline for Yuma Clapper Rail.** The environmental baseline for Yuma clapper rails includes past and present impacts of all actions and human activities in the Roosevelt area. There have been no previous Section 7 consultations for the Yuma clapper rail at Roosevelt since its presence has only been recently documented. Existing habitat conditions at Roosevelt from on-going reservoir operation, hydrologic conditions, and human activity provide the baseline from which potential effects are evaluated.

#### **Effects of No Permit Alternative.**

*Impacts on Yuma Clapper Rail Habitat.* There would be no direct affect to existing Yuma clapper rail habitat under the No Permit alternative because all potentially suitable

habitat is located at an elevation below the maximum conservation storage space of 2,095 feet. Operation of the reservoir at a lower new maximum elevation may however, cause a change in the existing cattail marsh habitat or create new habitat. The amount of potentially suitable habitat available under the No Permit alternative is difficult to predict, because stream channels are often scoured during periods of high runoff. As a result, it is unlikely that the amount of habitat on average would be substantially greater than existing conditions.

*Impacts on Yuma Clapper Rail Productivity.* Because there is no recorded Yuma clapper rail breeding activity at Roosevelt, it is difficult to determine potential effects on their productivity. Existing cattail marshes provide suitable habitat for possibly two nesting pairs should Yuma clapper rails decide to use Roosevelt for breeding; however, there may be other factors besides suitable breeding habitat that influence long-term Yuma clapper rail activity at Roosevelt.

*Offsite Impacts.* Potential offsite impacts to Yuma clapper rails are possible from increased reservoir releases from the Salt reservoirs that could potentially scour downstream marsh habitat. A reduction in maximum spills from Verde River reservoirs may benefit marsh habitat. Historically Yuma clapper rails have used habitat below Granite Reef, although there have been no observations since 1985 and scouring floods destroyed potential habitat in 1993. Periodic high runoff from increased reservoir releases under the No Permit alternative could make it difficult for suitable habitat to reestablish below Granite Reef. Yuma clapper rail habitat located further downstream on the Gila River could likewise be adversely affected by an increase in reservoir releases.

*Conservation Measures for Yuma Clapper Rails.* No conservation measures would be implemented under the No Action alternative.

#### **Effects of Full Operation Alternative (Proposed Action).**

*Impacts on Yuma Clapper Rail Habitat.* Currently there are about 4 acres of potentially suitable Yuma clapper rail habitat present in two narrow strips along Tonto Creek at an elevation below 2,151 feet. The continued operation of Roosevelt may inundate the existing marsh habitat and any Yuma clapper rail nest sites that may be present. The frequency and extent of impact on habitat from lake operation would depend on several factors, including the magnitude and timing of scouring inflows. Scouring inflows are common along the Tonto Creek inlet to Roosevelt and high streamflow may destroy existing marshes prior to reservoir filling or in the future with periodic changes in reservoir levels. Reservoir operation is not expected to impact all Yuma clapper rail habitat or potential nesting at Roosevelt every year and, in many years would not adversely impact habitat or nesting.

The development of substantially more habitat than the 4 acres of cattail marsh that currently exist at Roosevelt is unlikely because of periodic scouring flows and the existing very low reservoir levels conditions that have created marsh habitat occur infrequently. Thus, the maximum amount of cattail marsh below elevation 2,151 feet likely to be impacted in any one year at Roosevelt is estimated at 5 acres in order to allow for about 20 percent more marsh to develop and be impacted than the existing amount of 4 acres. However, variations in hydrological conditions and changes in vegetation



dynamics could combine to exceed this amount. Because it is not possible to estimate the amount of occupied habitat that might be present above the predicted maximum level, adaptive management would be employed to address such increases if they occur. If occupied habitat increases at Roosevelt, those increases would be addressed through adaptive management of up to an additional 5 acres or a total of 10 acres. If future occupied habitat exceeds 10 acres, a permit amendment would be required.

*Impacts on Yuma Clapper Rail Productivity.* It is difficult to estimate the periodic loss of productivity for Yuma clapper rails because there is no known breeding activity at Roosevelt. Better estimates are likely to be available after surveys are conducted by SRP following permit issuance. In the meantime, it appears unlikely that more than a single pair would occupy each of the small areas of existing marsh. Based on that assumption, it is estimated that two pairs of Yuma clapper rails could occupy the maximum predicted 5 acres of potentially suitable habitat present at Roosevelt. If available habitat increases, the number of breeding pairs could increase proportionally depending on the location, size and quality of habitat.

Direct impacts to Yuma clapper rail nests or eggs is possible if nesting occurs in the early spring while lake levels are still rising. No direct loss of adult Yuma clapper rails is likely, since they would abandon nest sites if inundated. The periodic modification or elimination of Yuma clapper rail habitat due to inundation is likely to result in delayed or lost breeding attempts, decreased productivity and survivorship of adults that disperse, and decreased productivity at Roosevelt. However, the number of birds affected cannot be accurately estimated because of uncertainties in: 1) Yuma clapper rail use of Roosevelt for breeding; 2) inundation extent, duration, and frequency; 3) the current and future amount of occupied habitat; and 4) reproductive success after dispersal.

*Offsite Impacts.* No offsite impacts to Yuma clapper rails or their habitat were identified. Periodic flood events have the potential to scour possible Yuma clapper rail habitat downstream from Roosevelt on the Salt and Gila Rivers. Lower average and maximum reservoir spills on the Salt River may benefit marsh habitat potentially used by Yuma clapper rails.

*Conservation Measures.* Conservation measures for Yuma clapper rails are more fully described in the mitigation measures included in Chapter 3. Planned conservation measures include the creation of potentially suitable cattail marsh habitat at the Rockhouse Farm site on the Salt Arm of Roosevelt. The creation of 5 acres of habitat at this location is expected to replace the maximum potential impact from full reservoir operation. Adaptive management measures would be used to address impacts to Yuma clapper rail habitat greater than 5 acres.

#### **Effects of Re-Operation Alternative.**

*Impacts to Yuma Clapper Rail Habitat.* Potential impacts to Yuma clapper rail under the Re-Operation alternative would be essentially the same as the Full Operation alternative. Existing potentially suitable habitat is located below the maximum elevation of 2,125 feet used in the Re-Operation alternative. A loss of the existing 4 acres of habitat is possible from periodic inundation due to reservoir operations. A maximum future impact of 5 acres of Yuma clapper rail habitat is estimated based on the limited

potential for development of cattail marsh in an environment subject to frequent channel scouring and inundation.

*Impact on Yuma Clapper Rail Productivity.* Potential impacts to Yuma clapper rail productivity would be the same as the Full Operation alternative. An estimated two Yuma clapper rail territories and the associated production could be lost if existing habitat is inundated from reservoir re-operation. The periodic loss of habitat is likely to result in delayed or lost breeding attempts, decreased productivity and survivorship of adults that disperse, and decreased productivity at Roosevelt.

*Offsite Impacts.* No direct offsite impacts to Yuma clapper rails or their habitat were identified. The release of additional flood flows from Roosevelt could scour potential Yuma clapper rail habitat located downstream on the Slat and Gila Rivers.

*Conservation Measures.* The creation of 5 acres of cattail marsh habitat at Rockhouse Farm, as described for the Full Operation alternative would be used to provide replacement habitat. Adaptive management measures would be used to address impacts to Yuma clapper rail habitat greater than 5 acres.

#### **4.6.2.3 Impact to Bald Eagles**

**Approach for Effects Assessment.** The effect of future reservoir operations on bald eagles at Roosevelt are difficult to readily quantify because of the variety of different factors that influence their activity and behavior near Roosevelt. Potential effects to bald eagles are possible from changes in habitat characteristics, changes in prey availability, and possibly competition between existing pair groups. Direct effects on existing nest trees from inundation from filling of Modified Roosevelt were previously addressed in Reclamation BOs. The analysis of the potential effect to bald eagles from alternative reservoir operations is based on three primary areas of concern for the Pinto Creek, Tonto Creek, and Pinal breeding areas at or near Roosevelt Reservoir and the three breeding areas in the vicinity of the reservoir including:

- Possible impacts on the availability of nesting and perching habitat
- Possible impacts of fluctuating water levels on prey productivity/selection
- Possible impacts on the productivity of the existing nest sites from increased inter-specific competition with reduced water levels

**Environmental Baseline for Bald Eagles.** The environmental baseline is “the past and present impacts of all Federal, State or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process” (50 CFR §402.02). Eagles in the vicinity of Roosevelt have been the subject of extensive prior consultation by Reclamation during the planning and construction of Modified Roosevelt Dam. The potential take of all bald eagle nest sites within the three known breeding areas (BAs) near Roosevelt associated with the effect of higher reservoir levels from dam construction have been previously addressed and mitigated pursuant to Section 7 of the ESA.

In 1983, FWS issued the initial BO on the Central Arizona Water Control Study (Plan 6), which included potential modifications to Roosevelt Dam (FWS 1990). Reclamation implemented the RPA for the pair of eagles occupying the Pinal breeding area by modifying the extent and timing of borrow excavation at Meddler Point near the nest and by restricting recreation access to the area.

In 1990, FWS issued a BO that addressed the Sheep and Pinto breeding areas as well as eagle use of a large cottonwood gallery at the mouth of Tonto Creek. The BO found that higher lake levels made possible by the modifications to Roosevelt would result in the eventual loss of all or a portion of the cottonwoods, including nesting trees, below elevation 2,151 feet but also found that there would be offsetting benefits of additional shallow water habitat and fringe wetland areas created by higher reservoir levels. In addition, FWS found that the eagles would benefit from the improvement of riparian habitat in the Tonto Creek Riparian Unit (TCRU) established by Reclamation and the Tonto National Forest as mitigation for Modified Roosevelt Dam. FWS concluded that the Roosevelt modifications were not likely to jeopardize the continued existence of eagles in the Southwest. Pursuant to the BO, Reclamation will implement two measures to minimize incidental take to the Pinto nest: 1) construction of an eagle nesting platform in the Pinto nest area at least 4 years before the nest is anticipated to collapse; and 2) closure of the Pinto nest area to recreation use during the breeding season if it becomes active (Reclamation 1992, p. 3).<sup>50</sup> In addition, Reclamation implemented one of the conservation measures identified by FWS—purchase of the Rockhouse Farm property near the Salt River inlet to create riparian habitat.

In 1993, FWS consulted with Reclamation following the discovery of a new eagle nest at the mouth of Tonto Creek. As in the 1990 BO, FWS concluded that the Roosevelt modifications were not likely to jeopardize the continued existence of eagles in the Southwest. The 1993 BO describes the eventual loss of the existing Tonto and Pinto Creek nest trees and nests as a result of inundation, and the subsequent loss of trees, nests, productivity, eggs and fledglings from inundation and recreation impacts over the next 50 years. FWS determined that there will be long-term offsetting effects as higher reservoir levels support cottonwoods farther upstream and as habitat improves in the TCRU. Reclamation implemented the three measures proposed by FWS to minimize incidental take to the Tonto nest: 1) seasonal closure around the breeding area; 2) annual

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<sup>50</sup> The Pinto nest has become productive since 1990. Nest trees do not appear to be in imminent danger of collapse and the area has not needed closure due to limited access and closure of the area for flycatchers. When lake levels rise, Reclamation will work with the Forest Service to place buoys around the nest tree to keep boaters out of the area.

monitoring support for the Tonto breeding area; and 3) notification of FWS and assistance in rescue efforts if inundation of eggs or nestlings may occur.<sup>51</sup>

Chapter 2 contains additional information on measures previously implemented by Reclamation to mitigate effects of Modified Roosevelt on bald eagles.

**Effects of No Permit Alternative.** The No Permit alternative restricts the storage of water at Roosevelt to an elevation no greater than 2,095 feet under normal operations. The dynamics of individual bald eagle breeding areas, wintering areas, and foraging areas would continue to change seasonally and annually, depending on a variety of environmental and ecological influences, including lower overall fluctuations in reservoir levels.

*Impact on Availability of Bald Eagle Nesting and Perching Habitat.* Reducing reservoir levels to lower than historical levels would eliminate the potential inundation of existing Pinto and Tonto nest trees; however, these trees may be adversely affected by lower lake levels that reduce supporting hydrological conditions. The development of new cottonwood and willows at lower elevations near the new maximum water elevation of 2,095 feet may eventually replace existing trees used by eagles. Growth of large trees below 2,095 feet is possible but inundation at 1- to 6-year intervals based on historical runoff patterns is likely to prevent substantial nest or roost tree development.

*Effect of Fluctuating Water Levels on Prey Productivity and Selection.* The available lake surface area at capacity under the No Permit alternative would be about 44 percent less than the Full Operation alternative. A reduction in shallow water habitat would reduce lake productivity and fishery production. Fish carrion would still be available and spawning fish at Roosevelt tributaries would continue to provide eagle foraging opportunities. Waterfowl might concentrate more in a smaller reservoir and would likely be more susceptible to eagle predation, particularly during winter. Also, bald eagles may switch to mammalian prey during low-water periods if other sources of prey are reduced (Hayward and Ohmart 1986).

*Impacts on the Productivity of the Existing Breeding Areas from Increased Interspecific Competition.* A reduction in shallow water areas and foraging habitat may lead to increased competition for prey resources among bald eagles. Lower reservoir levels likely would decrease the probability of establishment of new nesting trees, which may increase competition between existing breeding pairs. These factors are likely to adversely impact bald eagle productivity. As discussed for the Full Operation alternative, reduced Roosevelt lake levels appear to be correlated with reduced bald eagle productivity. Because the No Permit alternative would maintain substantially lower lake

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<sup>51</sup> Reclamation provides funding for the Tonto breeding area nestwatch. Reclamation has worked with SRP to develop a protocol to be implemented in case rising lake levels threaten eggs or nestlings. The Tonto National Forest is responsible for implementing the closure of the Tonto breeding area. The Forest Service has erected signs in the area and nestwatchers are posted at the breeding area. Also, Reclamation has provided buoys to the Forest Service to be used when the lake levels rise (Messing pers. comm. 2002).

levels than the Full Operation or Re-operation alternatives, bald eagle productivity is likely to decrease over the long term.

*Offsite Impacts.* Indirect impacts on eagle breeding areas on the Verde River downstream of Bartlett Reservoir could occur from a reduction in maximum spills of Verde River reservoirs. Reduced maximum spills may protect any existing suitable nest or roost trees but also could decrease the conditions favorable for establishing new cottonwood trees and riparian vegetation. In addition, reductions in productivity of bald eagles that forage at Bartlett and Horseshoe reservoirs may occur from lower lake levels (Table 12). Lower lake levels may reduce productivity because of reduced prey availability and increased competition (SRP 2002c).

*Bald Eagle Conservation Measures.* No new conservation measures would be implemented for the No Action alternative. Previously implemented mitigation measures by Reclamation would remain, but additional measures would not be developed. SRP would continue assisting with surveys and support of bald eagle conservation.

**Effects of Full Operation Alternative (Proposed Action).** Bald eagle breeding areas, wintering areas, and foraging areas (both winter and summer) are dynamic, changing with prey availability, nest site suitability, interspecific competition, human disturbance, and other factors. These dynamics at Roosevelt are expected to continue to be influenced by rising and falling water levels. Previous consultations for Modified Roosevelt addressed the potential take of bald eagles from inundation of nest trees at Roosevelt. The Full Operation alternative would not result in a direct take of bald eagles or additional impact to existing breeding areas. Should suitable nesting or perch trees develop within the Reservoir lakebed during a period of extended drought, subsequent inundation could affect bald eagle habitat. In addition, lower lake levels may result in decreased productivity during periods of drought.

*Impact on Availability of Bald Eagle Nesting and Perching Habitat.* Given the dynamics of Roosevelt lake levels, mature cottonwoods that form the primary eagle nesting and perching habitat typically would be confined to the shoreline areas near the maximum elevation of the lake and tributary inflows similar to the current nest and perch sites. Many of the young cottonwoods and willows that may periodically grow on the lakebed likely would be inundated and die before maturity.<sup>52</sup> Based on historic hydrologic data (1889 to 1994), it is anticipated that trees within the lakebed below an elevation of 2,151 feet would be inundated every 1 to 25 years. Even during periods of drought, there may be interim periods of high reservoir levels that would inundate most of the lakebed for short periods. Cottonwoods that survive short periods of inundation may attain sufficient size to provide perches or nest sites.

*Effect of Fluctuating Water Levels on Prey Productivity and Selection.* Bald eagles are opportunistic and will change prey based on the most readily available prey sources both seasonally and annually. Catfish and carp are the most common prey for the Pinto

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<sup>52</sup> Cottonwoods seedlings are highly sensitive to inundation with mortality occurring within weeks of inundation; mature cottonwoods tolerate root crown inundation for several months. (Appendix 4 of the RHCP).

and Pinal bald eagle breeding pairs at Roosevelt during the spring and summer breeding season (Rubink and Podborny 1976; Hunt et al. 1992). Shallow water habitats provide the best foraging areas for preying on live fish. Maintenance of higher reservoir levels under the Full Operation alternative would increase lake productivity as fish take advantage of food resources and cover provided by vegetation on inundated beaches. At high reservoir levels, the areal extent of shallow water would increase, providing additional breeding and foraging areas for carp and catfish and increase their susceptibility to predation. The availability of fish carrion is not expected to be impacted by fluctuating water levels. Spawning fish foraged from streams and rivers may be important for short periods during various spawning seasons, but are generally not affected by fluctuating reservoir levels.

Waterfowl comprise a major portion of the bald eagle's winter diet at Roosevelt. The total number of available wintering waterfowl would be expected to remain relatively constant and should not be substantially affected by water elevation in the reservoir. Typically, Roosevelt water levels are lowest during winter months and low water levels may concentrate waterfowl in winter, increasing their vulnerability to eagles. During low water levels, Hayward and Ohmart (1986) concluded that mammalian prey is essential to satisfy energy demands of bald eagles breeding in Arizona. Overall, bald eagle prey productivity and foraging opportunities on and near Roosevelt Reservoir would be similar to current conditions. Bald eagles would continue to adapt their food habits and foraging strategies based on seasonal prey availability. The overall fitness of the bald eagles should remain relatively stable under the Full Operation alternative.

*Impacts on the Productivity of the Existing Bald Eagle Breeding Areas from Increased Interspecific Competition.* Foraging areas and home ranges of bald eagles are dynamic, shifting annually, seasonally, and even daily depending on prey resources, weather and inter- and intra- species competition (Hunt et al. 1992). Studies conducted by Biosystems (Id.) found that the eagles from the Pinal pair foraged primarily over the Salt River because of competition between the Pinto and Pinal females. Competition for foraging habitat between other nesting pairs of bald eagles is also likely occurring (Driscoll, pers. comm. 2001). A recent decline in the productivity of bald eagles at Roosevelt, as well as other reservoirs in Arizona may be due in part, at least for more "marginal" breeding areas, may be due in part to the effect of increased competition and reduced prey availability from lower lake elevations in the past few years (Keane, pers. comm. 2002). Under the Full Operation alternative, periodically low reservoir elevations at Roosevelt during drought periods or from operational releases may contribute to increased competition between eagles for scarce food resources. Competition may result in reduced nesting productivity for some breeding pairs if compared to maintaining the lake at above average elevations. Overall the Full Operation alternative would provide higher average reservoir elevations when compared to the No Action and Re-Operation alternatives, which should benefit bald eagle productivity and reduce interspecific competition.

Reduced productivity of bald eagles near Roosevelt appears to be associated with low reservoir levels, based on historical records of productivity and reservoir elevations. Anticipated periods with low reservoir levels (< 2,100 feet) under the Full Operation

alternative over the 50-year permit life may lower bald eagle productivity during some years. Estimates of reduced productivity indicate about 18 fewer fledglings would be produced at Roosevelt compared to maintaining the reservoir at average levels.

*Offsite Impacts.* No offsite impacts to bald eagles below Roosevelt and on the Verde River below SRP reservoirs were identified for the Full Operation alternative.

*Bald Eagle Conservation Measures.* In order to minimize and mitigate the potential impact on bald eagle habitat and any resulting indirect take of bald eagles, the RHCP includes implementation of the following measures:

- SRP would complete a pilot project, included as a conservation measure in the 1990 BO, to establish riparian vegetation, including cottonwoods, at the Rockhouse site on the Salt River Arm.
- After construction by Reclamation, SRP would maintain the Pinto nesting platform for the duration of the RHCP.
- SRP would acquire mitigation habitat for flycatchers on the Verde and San Pedro rivers (and elsewhere if necessary), much of which is comprised of cottonwoods and willows that may be suitable or may become suitable for eagle nesting or roosting.
- If feasible, SRP would financially support restoration efforts such as fencing of cottonwood and other riparian vegetation used by bald eagles along the Verde River on the Fort McDowell Reservation.
- In addition, SRP would continue supporting efforts to protect bald eagle populations, as it has since the early 1990s, and would contribute about \$13,000 annually to conservation efforts. SRP also contributes helicopter time, cartographic services for eagle surveys, and a bucket truck and crew as needed to aid in eagle chick banding efforts.

**Effects of Re-operation Alternative.** The Re-operation alternative restricts the storage of water at Roosevelt to an elevation no greater than 2,125 feet under normal operations. The Re-Operation alternative would not result in a direct take of bald eagles or additional impact to existing breeding areas.

*Availability of Bald Eagle Nesting and Perching Habitat.* The Re-operation alternative would have a minor net impact on bald eagle nesting vegetation because reservoir levels would be very similar to the historical range. Reducing reservoir levels to lower than historical levels would eliminate the potential inundation of existing Pinto and Tonto nest trees. Development of new cottonwood stands suitable for nesting or perching below the maximum reservoir elevation of 2,125 feet is expected to occur infrequently because periodic inundation (1 to 8 years) would probably prevent maturation of large trees.

*Effect of Fluctuating Water Levels on Prey Productivity and Selection.* Bald eagle foraging opportunities would be similar to current conditions. A lower reservoir level (21 percent less surface area at capacity compared to the Full Operation alternative) would reduce shallow water habitat and fish productivity. This would slightly reduce foraging opportunities, although a smaller reservoir may concentrate fish for a brief period. Carrion fish and spawning fish in Roosevelt tributaries would not be substantially

affected. Waterfowl and small mammals would remain a component of the winter diet. Available prey and foraging opportunities are unlikely to limit bald eagle activity at Roosevelt under the Re-operation alternative.

*Impacts on the Productivity of the Existing Bald Eagle Breeding Areas from Increased Interspecific Competition.* Competition for foraging habitat among bald eagle pairs near Roosevelt may increase slightly with a lower average reservoir elevation. Reduced prey availability and competition may result in reduced bald eagle productivity. Reduced reservoir levels would result in a lower fledgling production compared to the Full Operation alternative, and higher productivity than the No Permit alternative.

*Offsite Impacts.* Reduced productivity of bald eagles that forage at Bartlett and Horseshoe reservoirs is possible from a decrease in reservoir levels, which affects prey availability and competition. Reduced maximum flood flows in the Verde River would minimize impacts to suitable eagle nest or roost trees, but may reduce the potential for creating disturbances that are needed for riparian habitat creation. The increased maximum spills on the Salt River would not affect existing bald eagle nest sites located on cliffs, but could scour possible nest trees.

*Bald Eagle Conservation Measures.* Bald eagle conservation measures would be similar to those for the Full Operation alternative. This includes creation of riparian habitat on the Salt arm of Roosevelt and acquisition and protection of riparian habitat on the Verde and San Pedro rivers and other locations that may provide suitable bald eagle nesting or foraging habitat. In addition, SRP would continue supporting efforts to protect bald eagle populations, as described for the Full Operation alternative. Previously implemented mitigation measures by Reclamation would remain, but additional measures may not be developed.

#### **4.6.2.4 Impact on Cuckoos**

**Approach for Effects Assessment.** The analysis of the impact of future reservoir operations on cuckoos at Roosevelt focuses on riparian vegetation communities that provide habitat. Future operation of Roosevelt that involves periodic inundation of riparian vegetation or desiccation of existing habitat may potentially affect cuckoos. As for flycatchers and bald eagles, impacts would not occur as a single event and the amount of impact cannot be accurately predicted for any specific future date. Direct impacts on cuckoos or their nests or eggs is difficult to quantify, but are expected infrequently in the form of nest tree fall due to previous inundation and perhaps due to disturbance by recreational boaters when water levels are high. Given that the direct loss of cuckoos at Roosevelt is uncertain, the assessment of impacts on habitat was used in the analysis. Information on existing suitable habitat at Roosevelt is used to estimate potential impacts on cuckoos.

**Environmental Baseline for Cuckoos.** The environmental baseline for cuckoos includes past and present impacts of all actions and human activities in the Roosevelt area. Because the cuckoo is not a federally listed species, there have been no previous Section 7 consultations. The environmental baseline represents the existing conditions in the Roosevelt area as influenced by current reservoir operation, precipitation and runoff, recreation, and other human activity.



### **Effects of No Permit Alternative.**

*Impacts to Cuckoo Habitat.* Inundation of existing cuckoo habitat would be avoided because Roosevelt reservoir levels would be held at lower than existing levels. Indirect effects to existing cuckoo habitat is likely as habitat at higher elevations within the existing lakebed dries up as the water level recedes. The amount of suitable habitat available for cuckoos over the long term would vary with precipitation, runoff, and lake levels. Habitat in the immediate vicinity of the lake on the inflow deltas likely would remain viable because of the presence of nearby water and a higher ground water level. Shifts in habitat structure and composition would occur as vegetation matures or regenerates, which would affect habitat suitability. Restricting the operation of reservoir levels to a maximum elevation of 2,095 feet likely would result in smaller amounts of cuckoo habitat over the long term than current conditions because the reservoir would operate within a narrower range of elevations.

*Impacts to Cuckoo Productivity.* In the short term, existing suitable cuckoo habitat would be preserved if a lower reservoir is maintained. As cottonwood and willow trees mature in areas that provide suitable hydrologic conditions, cuckoo nesting activity at Roosevelt may increase. In the long term, as existing riparian vegetation at higher elevations begins to dry out, the total amount of suitable habitat is likely to diminish, which would adversely impact cuckoo habitat and use.

*Offsite Impacts.* The No Permit alternative may have a slight indirect impact on potential cuckoo habitat on the Verde River downstream of Bartlett Reservoir. A reduction in maximum annual flood spills would decrease the potential for vegetation scouring, which reduces impacts to existing riparian vegetation that potentially provides cuckoo habitat on the Verde River, but also may reduce the potential for regeneration of young riparian vegetation. The small increase in average annual spills on the Verde River may provide additional water for riparian vegetation. An increase in maximum spills on the Salt River could potentially scour riparian habitat suitable for cuckoos, but there is no record of cuckoo use on the Salt River.

*Conservation Measures for Cuckoos.* No conservation measures would be implemented under the No Permit alternative. Habitat acquisition previously initiated by Reclamation for flycatchers would benefit cuckoos, but no additional habitat protection measures would be conducted.

### **Effects of Full Operation Alternative (Proposed Action).**

*Impacts to Cuckoo Habitat.* Under the Full Operation alternative, fluctuations in water levels due to reservoir operations are expected to modify suitable habitat with subsequent impacts to cuckoos. It is assumed that riparian habitat between 2,136 and 2,151 feet in elevation would only be temporarily inundated prior to the cuckoo breeding season and is unlikely to be adversely impacted. An estimated 313 acres of potentially suitable cuckoo habitat is located below an elevation of 2,136 feet and would be adversely affected during periods of inundation. A portion of this habitat would be inundated during the breeding season in some years and if inundation is for more than 12 months, the vegetation is likely to die. Periodic temporary inundation would assist in riparian habitat maintenance in portions of the lakebed.

The inundation or drying out of the estimated 41 acres of potentially suitable cuckoo habitat above an elevation of 2,136 feet is possible under the Full Operation alternative. However, because this vegetation remains during the current drought and would be subject to occasional short-term inundation, it is likely that it would persist in the future.

*Impacts to Cuckoo Productivity.* The periodic loss of cuckoo habitat due to inundation may affect cuckoo use of Roosevelt. During periods of inundation, the amount of suitable vegetation for cuckoo nesting would be reduced, which may cause cuckoos to abandon or seek suitable nesting habitat elsewhere. Fragmentation of suitable habitat may reduce the chance for individuals to locate suitable nest sites and reduce cuckoo productivity. Future surveys would be used to determine cuckoo breeding activity at Roosevelt.

*Offsite Impacts.* No offsite impacts for cuckoos were identified.

*Conservation Measure for Cuckoos.* Separate habitat mitigation for the cuckoo is not anticipated because proposed onsite and offsite mitigation for flycatchers and bald eagles also would benefit cuckoos. Habitat requirements for cuckoos, eagles, and flycatchers overlap to a large degree. Cuckoos and flycatchers are very similar in their habitat use. Both require blocks of tall dense riparian vegetation, including willows and cottonwoods, for foraging and nesting, and habitat must be relatively close to open water. Cuckoos require larger blocks of suitable habitat and do not nest as closely together as flycatchers. Cuckoo and eagle habitat requirements also overlap somewhat. Eagles use mature cottonwood trees for nesting and perching. Cuckoos also may use cottonwoods for nesting and foraging. Cuckoos might benefit from closure of eagle nesting areas to recreational use during the breeding season.

Because the conservation measures for flycatchers and eagles are intended to support cuckoos as well, the following considerations were included in the selection of mitigation sites in the RHCP:

- Cuckoos benefit from the creation or protection of riparian areas composed of dense cottonwood/willow complexes.
- Some of the cottonwood/willow complexes should be at least 10 acres in size.
- Cottonwood/willow complexes should be provided in blocks rather than in strips to the maximum extent possible.
- To the degree feasible, riparian habitat complexes should be located in areas that favor a natural succession of vegetation so that there will be periodic establishment of riparian vegetation patches.

Creation of cottonwood/willow habitat on the Salt arm of Roosevelt, protection and maintenance of riparian habitat at Roosevelt, and conservation of riparian complexes on the Verde, San Pedro, or other rivers would benefit cuckoos. In addition, habitat preserved as a result of existing and on-going mitigation of the Modified Roosevelt Dam is beneficial to cuckoos.

### **Effects of Re-operation Alternative.**

*Impacts to Cuckoo Habitat.* Potential impacts to cuckoo habitat would occur from inundation of about 60 acres of habitat located below an elevation of 2,110 feet. It is assumed that riparian habitat between elevations 2,110 and 2,125 feet would only be temporarily inundated and would not be adversely affected by flooding. It is anticipated that, in the long term, a band of suitable cuckoo habitat may be established adjacent to Tonto Creek and the Salt River. The range of reservoir fluctuation would be slightly less than historical levels under the Full Operation alternative and wider than the No Action alternative. On average, the area of tall dense vegetation suitable for cuckoos is likely to fall between these two alternatives, although the amount of suitable habitat would vary annually and is difficult to predict. In addition, infrequent direct take may occur due to the fall of nest trees containing eggs or fledglings as a result of tree inundation.

*Impacts to Cuckoo Productivity.* Potential effects to cuckoo breeding and productivity are possible with modifications to reservoir operation. A decrease in breeding habitat would reduce nesting success and survivorship. Establishment of a viable breeding population of cuckoos would be more difficult to the extent that habitat becomes fragmented or isolated. Impacts to the regionwide cuckoo population in Arizona are likely minor because of limited existing cuckoo breeding at Roosevelt.

*Offsite Impacts.* The same downstream and offsite impacts on cuckoos would occur as with Alternative 1, except annual maximum discharges on the Verde River would be lower, which reduces potential scouring of riparian habitat and conditions for habitat creation.

**Conservation Measures.** Conservation measures for the Re-Operation alternative would be similar to those for the Full Operation alternative. The acquisition, protection, and creation of habitat for flycatchers should provide suitable habitat for cuckoos. The amount of habitat protected would be in proportion to the habitat impacts determined for Full Operation.

#### **4.6.2.5 Other Sensitive Wildlife Species of Concern**

The lowland leopard frog does not maintain breeding habitat at Roosevelt, including the Salt River and Tonto Creek inlets, due to the presence of exotic predators. Any lowland leopard frogs found at Roosevelt are likely transients from surrounding drainages. These individuals and populations in adjacent drainages would not be affected by varying water levels or other habitat changes caused by operation of Roosevelt. To the extent that it occurs along Tonto Creek, the frog would not be affected by any alternatives evaluated in this EIS.

Native fish are not thought to exist in large numbers in Roosevelt, Tonto Creek or the Salt River near the lake due to habitat degradation and competition from and predation by introduced game fish. To the extent that they exist in these areas, they are unlikely to be affected by the reservoir operations for any of the alternatives because they are aquatic species.

The historical range of cactus ferruginous pygmy-owl is not known to have included the area near Roosevelt (Reclamation 1999, p. 12), although potentially suitable habitat is

present. The area around Roosevelt was not designated as critical habitat for this species (63 FR 71820, later remanded). If the cactus ferruginous pygmy owl is found near Roosevelt, it is most likely to occur in upland habitat not affected by reservoir operation under any of the alternatives.

None of the other upland species evaluated would be adversely affected by alternative reservoir operations. Because these species are not known to exist within the active conservation space at Roosevelt and are not dependent on riparian habitat, they would be unaffected by periodic inundation of that space.

#### **4.6.2.6 *Sensitive Plant Species of Concern***

All five of the plant species of concern near Roosevelt (Table 19) are upland species and are unlikely to be impacted by any of the reservoir operation alternatives.

### **4.7 Air Quality**

#### **4.7.1 Affected Environment**

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The Clean Air Act establishes two types of national air quality standards—primary standards and secondary standards. Primary standards set limits to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Air quality is generally good in the Roosevelt Lake area, and the area is in compliance with all NAAQS (Reclamation 1996a).

#### **4.7.2 Environmental Consequences**

##### **4.7.2.1 *Effects of No Permit Alternative (Alternative 1)***

A reduction in the maximum elevation of Roosevelt to 2,095 feet would have no significant effect on air quality.

##### **4.7.2.2 *Effects of Full Operation Alternative (Alternative 2)***

Continuing operation of Roosevelt would have no significant effect on air quality. Dust or smoke may occur for short periods of time if SRP removes dead vegetation from the lakebed. However, this is unlikely to occur more than a few times over 50 years.

A temporary increase in dust is possible during site preparation activities and road construction at the Rockhouse Farm site. This would have a negligible short-term effect on air quality and would not exceed applicable air quality standards.

##### **4.7.2.3 *Effects of Re-operation Alternative (Alternative 3)***

Potential effects to air quality would be similar to Alternative 2.

## 4.8 Visual Resources

### 4.8.1 Affected Environment

Roosevelt is located in a broad alluvial valley that provides views of mountainous and desert terrain. The lake is approximately 2 miles wide and stretches about 10 miles to the east and a similar distance to the northwest from Roosevelt dam. At the east and west ends of Roosevelt, salt cedar, cottonwoods, willows, and other riparian vegetation grow in abundance. The remainder of the lake is surrounded by sparse desert vegetation, creating a contrast between the blue water and the various earth tone colors of the desert (Reclamation 1996a).

Dominant visual features surrounding Roosevelt include the Sierra Ancha Mountains, Four Peaks Wilderness, and Mazatzal Mountains (USFS 1994). Views of the Upper Sonoran Desert and its flora and fauna also are popular visual amenities, particularly along the shoreline and within the Roosevelt Lake and Three Bar Wildlife Areas. The 357-foot dam structure is an impressive visual feature and popular scenic stop for visitors. The recently constructed arch span bridge above the dam also provides an additional dramatic structural component to the landscape.

Visual resources are an important consideration in the management of Tonto National Forest. Tonto National Forest uses a Visual Management System to inventory the visual resources on the Forest and to provide measurable management standards. The Visual Quality Objective (VQO) for an area is determined after an analysis of landscape variety and sensitivity levels. VQO categories include preservation, retention, partial retention, modification, and maximum modification. The VQO for Forest Service Management Area 6F, which includes the Roosevelt Lake area, is Retention (USFS 1985). To meet a Retention VQO, land use activities must not be visually evident to the average observer. Changes resulting from any activities must repeat form, line, color, and texture frequently found in the characteristic landscape. Changes in the qualities of size, amount, intensity, direction, and pattern must not be evident.

### 4.8.2 Environmental Consequences

Potential effects to visual resources at Roosevelt would occur from changes in reservoir operations. The Full Operation alternative constitutes the baseline for evaluation of the impacts from the other reservoir operation alternatives.

#### 4.8.2.1 *Effects of No Permit Alternative (Alternative 1)*

Under the No Permit alternative, the maximum reservoir elevation would be maintained at 2,095 feet. A reduction in maximum water storage levels would reduce the existing periodic inundation of vegetation. The visual character of Roosevelt would result in less open water and riparian vegetation near the lakeshore, and expansion of upland vegetation in the upper portion of the existing lakebed. The Tonto Creek and Salt River channels above elevation 2,095 feet within the existing lake would remain visible. None of the changes to the visual characteristics of the area would impact the VQO of retention because no unnatural elements would be added to the landscape.

Views of dominant visual features including the Sierra Ancha Mountains, Four Peaks Wilderness, and Mazatzal Mountains would not be impacted. In addition, views of Roosevelt Lake and the 357-foot dam structure would not be altered. A slight change in the visual quality at Horseshoe and Bartlett reservoirs would occur because of changes in reservoir storage at Roosevelt. On average, Bartlett would have slightly greater surface water elevations from January to June, and slightly lower elevations from July to December compared to the Full Operation alternative. Horseshoe Reservoir would have slightly greater elevations from February to April, and lower elevations for the rest of the year compared to the Full Operation alternative. Overall storage in Verde River reservoirs would be slightly less than the Full Operation alternative, which would alter the visual character of these reservoir sites.

#### ***4.8.2.2 Effects of Full Operation of Roosevelt (Alternative 2)***

There would be no effect on the existing quality of visual resources at Roosevelt. The Forest Service VQO for the area would be maintained. Verde River reservoir water levels would remain the same. Acquisition and maintenance of riparian habitat at various sites, including the Salt, Verde, and San Pedro rivers, would preserve and protect the visual integrity of these sites. The establishment of riparian vegetation at the Rockhouse site would add to the visual diversity of the landscape. The Rockhouse mitigation site would be designed to blend into the environment and provide a naturally appearing riparian community.

#### ***4.8.2.3 Re-Operation Alternative (Alternative 3)***

Visual quality would remain similar to existing conditions as the reservoir fluctuates primarily below a maximum elevation of 2,125 feet. On average, the surface elevation of Roosevelt would be lower than existing conditions. A long-term shift in the vegetation community above 2,125 feet would slightly change the visual character of Roosevelt during the cycles of open water/riparian vegetation/upland vegetation. None of the changes to the visual characteristics of the area would impact the VQO of retention because no unnatural elements would be added to the landscape. Bartlett Reservoir elevations would remain similar to existing conditions, except between July and March when elevations would be about 30 percent lower than current conditions. In Horseshoe Reservoir, water levels also would drop substantially in the summer through fall and would empty during August and September. Scenic quality of both of the Verde Reservoirs would be diminished during periods of low water runoff.

Similar to the Full Operation alternative, acquisition and protection of riparian habitat on the Verde and San Pedro rivers would provide long-term preservation of the scenic quality of natural riparian ecosystems. Development of the Rockhouse mitigation site would add visual diversity to the landscape.

## **4.9 Cultural Resources**

Cultural resources include a broad range of items and locations. Some examples of cultural resources are 1) archaeological materials and sites, 2) standing structures that are over 50 years of age or are important because they represent a major historical theme or era, 3) cultural and natural places, certain natural resources, and sacred objects that have

importance for Native Americans, and 4) American folklife traditions and arts (DOE 1993). The National Historic Preservation Act of 1966 (as amended), and its implementing regulations (36 CFR 800), require Federal agencies to consider effects on cultural resources before undertaking actions. Cultural resources can be separated into two groups: historic and prehistoric. Cultural resources are considered historic if they are more than 50 years old, and prehistoric if they date to the period before Euroamerican contact. If cultural resources meet certain criteria, they are considered eligible for inclusion on the National Register of Historic Places (NRHP). If a proposed project would alter or affect the characteristics for which the resources are eligible, measures must be developed and implemented to minimize or mitigate the effects.

Traditional cultural properties are those cultural resources that are eligible for inclusion on the NRHP because they possess significance to tribal religious beliefs or practices and cultural affiliation. Examples relevant to the Roosevelt area include locations associated with traditional beliefs of a Native American group, locations that Native American religious practitioners have historically used or are known to use today, or locations where a group has traditionally carried out economic, artistic, or other cultural practices.

#### **4.9.1 Affected Environment**

The land now covered by Roosevelt Lake, and other areas within the Reclamation land withdrawal areas were home to a series of nomadic and permanent settlements by prehistoric peoples. The first permanent settlements in the area date to about AD 800. By AD 1150 a new culture, a tribe of farmers called the Salado, had emerged. Settlements were established near the Salt River and gradually expanded into adjoining foothills. Some prehistoric remains were buried by the reservoir, and others remain above the high water line (TNM 2002). Intensive cultural resources surveys have been conducted around Roosevelt since 1984 as mitigation for various actions by Reclamation, the Forest Service, and Arizona Department of Transportation. Over 700 archaeological sites have been found and documented. Data recovery efforts have been ongoing since 1986. Prehistoric cultural evaluations include assessing the prehistoric occupants of the Tonto basin and studies of the Salado people (Reclamation 1996a).

Historic cultural resources include the Theodore Roosevelt Dam and its associated historical facilities, structures, and features. The Theodore Roosevelt Dam National Register District, which includes resources associated with the initial construction of Theodore Roosevelt Dam, is listed in the National Register of Historic Places (USDI 1998). It is the largest masonry dam in the world (Reclamation 1990). The dam was originally constructed between 1905 and 1911 to provide water for irrigation (SRP 2002a). It also has historic significance because of its role in the development of hydro-electric power (Reclamation 1990). The dam was altered in 1996. Reclamation conducted documentation studies of the dam, including architectural, engineering, and construction history. Other historically significant properties include retaining walls and the original power canal that transported water to generate hydro-electric power during the construction of the original dam (Reclamation 1990). It appears that no surveys for traditional cultural properties have been conducted in the study area.

## **4.9.2 Environmental Consequences**

### **4.9.2.1 *Effects of No Permit Alternative (Alternative 1)***

Any prehistoric or historic cultural resources at elevations higher than 2,095 feet would be at greater risk for scouring during flood events, which could destroy exposed resources. Any cultural resources exposed by a lower reservoir level would be subject to degradation from weathering or vandalism. There would be no new impacts to traditional cultural properties. No indirect effect to cultural resources downstream from Roosevelt or on the Verde River has been identified.

### **4.9.2.2 *Effects of Full Operation Alternative (Alternative 2)***

Prehistoric and historic cultural resources previously inundated would remain inundated. Inundation generally alters some of the contents and the physical relationships within a site, but does not usually result in the total destruction of a site. The severity of impacts varies with the frequency and duration of inundation (Reclamation 1996a). There would be no new impacts to traditional cultural properties. No indirect effect to cultural resources downstream from Roosevelt, on the Verde River, or mitigation sites has been identified. Any cultural features present on mitigation sites acquired on the Verde, San Pedro, and Gila rivers or elsewhere would be protected.

The proposed Rockhouse Farm riparian mitigation site near the Salt River inlet to Roosevelt would require vegetation clearing and grading of fallow agricultural land and a maintenance road along an existing ditch. An archeological survey of this site did not reveal any cultural remains or artifacts (Clark 2002). Because of numerous archeological sites recorded in the surrounding area, future ground-disturbing activities would be monitored for the presence of any cultural features.

Diverting water to the Rockhouse mitigation site would require rehabilitation of the Braddock/Rockhouse Ditch and the headgate located at the diversion dam on the Salt River. The diversion dam and power canal supplied water to generate power needed to construct Roosevelt Dam and were listed in the NRHP on March 16, 1998 by Reclamation as part of the Theodore Roosevelt Dam National Historic District. No alteration of the diversion dam would be required, and the project would not adversely affect its historic elements.

### **4.9.2.3 *Effects of Re-operation Alternative (Alternative 3)***

Similar to Alternative 2, prehistoric and historic cultural resources previously inundated would remain inundated. Those resources between 2,125 feet and 2,151 feet in elevation would be at greater risk from scouring flood events and vandalism. There would be no new impacts to traditional cultural properties. No indirect effect to cultural resources downstream from Roosevelt or on the Salt or Verde rivers has been identified. Any cultural features present on mitigation sites acquired on the Verde River, San Pedro River, or elsewhere would be protected.



## **4.10 Land Use and Land Ownership**

### **4.10.1 Affected Environment**

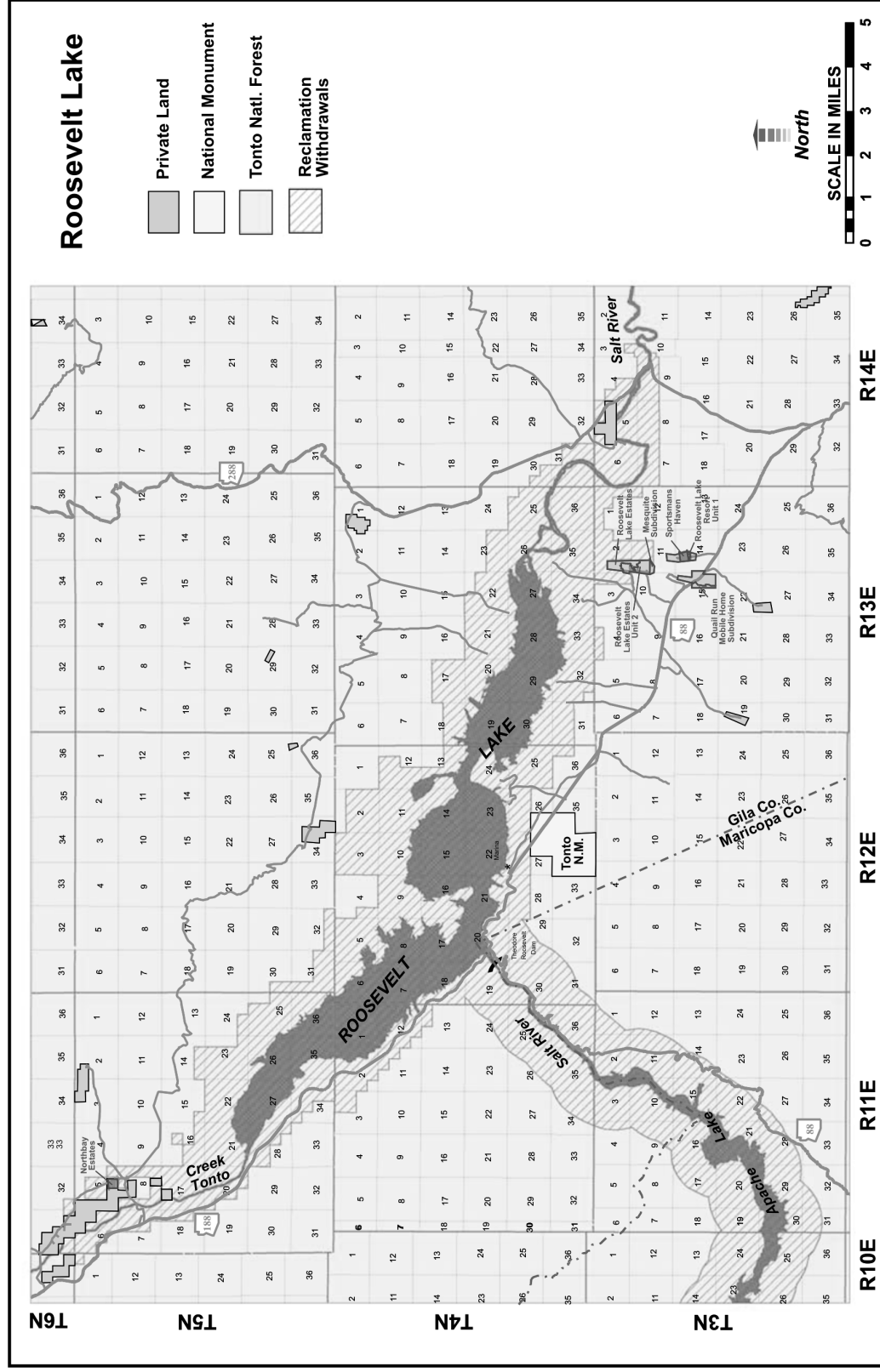
The primary land uses in the vicinity of Roosevelt Lake include recreation, wildlife habitat, livestock grazing, and limited residential housing and commercial businesses. Water stored behind Roosevelt Dam is on land withdrawn from the public domain in 1903 by Reclamation for purposes of the Salt River Project<sup>53</sup> (Figure 20). Additional land was withdrawn in 1999 to ensure that SRP could regulate the reservoir to meet conservation storage objectives under the Plan 6 Funding Agreement and the Modified Roosevelt Operating Agreement (Reclamation 1999). Withdrawn land surrounding Roosevelt is managed under a three-way agreement among SRP, Reclamation, and the Forest Service, with Tonto National Forest being responsible for management of recreation and other non-Reclamation land uses.

Public lands bordering the withdrawn lands are managed by the Forest Service, with the exception of the Tonto National Monument, which comprises 1,120 acres and is under the management of the National Park Service. The Forest Service manages National Forest lands according to uses specified under the Tonto National Forest Management Plan (USFS 1985). The Tonto National Forest Management Plan designates the Roosevelt area as Management Area (MA) 6F. MA 6F is managed primarily for water-oriented recreation. Management directives for MA 6F focus on maintenance and management of water-oriented developed and dispersed recreation (mostly serving boaters and their crafts, and campers), crowd and site capacity control, interpretive activities, recreational trails maintenance, and visitor assistance. None of the activities on or around Roosevelt, including recreation and other permitted uses such as grazing, concessionaires (e.g., Roosevelt Lake Marina), and plant collection, are under the control of SRP. Principal land use activities in the Roosevelt area are described below.

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<sup>53</sup> See letter from E.A. Hitchcock, Secretary of Interior to the Commissioner of the General Land Office, March 9, 1903.

Figure 20. Land Ownership Map.



#### **4.10.1.1 Recreation**

Popular recreation activities include water-oriented activities such as boating and fishing, as well as camping, hiking, and sightseeing. A description of recreation resources is provided in the Recreation section.

#### **4.10.1.2 Residential and Commercial**

Residential land uses in the vicinity of Roosevelt are primarily concentrated upstream from the lake along Tonto Creek. Development on private lands within the Tonto Creek watershed is driven by demand for vacation homes, retirement homes, and a rural living experience. Smaller residential communities, including the Lake Estates Subdivision, and scattered commercial businesses exist on the Salt arm of Roosevelt. Commercial businesses near residential areas cater primarily to the tourist trade.

#### **4.10.1.3 Grazing**

Grazing is permitted throughout much of MA 6F within designated areas called grazing allotments managed by Tonto National Forest. Approximately 35,326 acres of MA 6F are classified as rangeland (USFS 1990). One of the most historically productive rangeland areas can be found in the Tonto Basin Grazing Allotment, situated within the Tonto Creek watershed upstream from Roosevelt. Recent data related to watershed conditions in the Tonto Basin Grazing Allotment show that while improvements have been made in rangeland management over the last 75 years, conditions are generally poor and recovery has been slow (Garcia and Associates 2001). Although grazing allotments exist adjacent to Roosevelt, grazing is managed to minimize impacts to listed species (Woods, pers. comm. 2002).

### **4.10.2 Environmental Consequences**

#### **4.10.2.1 Effects of No Permit Alternative (Alternative 1)**

This alternative would not directly impact residential and commercial land uses occurring outside of withdrawn lands. Concessioners that operate within withdrawn lands under a USFS special use permit (such as Roosevelt Lake Marina) would be affected if there is a decrease in the number of visitors. The economic effect associated with a reduction in recreation visitors is discussed in Section 4.12. Existing grazing and grazing allotments would not be affected. No land use effects were identified for downstream locations on the Salt River or Verde River reservoirs.

#### **4.10.2.2 Effects of Full Operation Alternative (Alternative 2)**

There would be no change in water-based recreation and other land uses at Roosevelt. The existing pattern of land ownership and land use would be maintained, including residential communities, commercial businesses, and grazing.

Mitigation measures related to the protection, enhancement, or restoration of riparian habitat along the Verde River, San Pedro River, and elsewhere in Arizona would result in a permanent land use on those sites for the protection and conservation of listed and candidate species. These lands would be protected in perpetuity from development or

other land-disturbing activities. Mitigation properties would continue to be subject to natural climatic disturbances.

The creation of riparian habitat at the Rockhouse Farm site would result in the conversion of former agricultural land into irrigated riparian habitat. Any future agricultural use of this site would be precluded. At this site, there would be a long-term change in land use for the conservation of listed and candidate species. Public access to this site would be restricted.

#### ***4.10.2.3 Effects of Re-operation Alternative (Alternative 3)***

There would be no direct effect to residential land uses but potential changes in recreation and visitor use are possible with a smaller reservoir as discussed in the Recreation section. Concessioners' operations would be affected by any reduction in tourism as a result of a lower reservoir. Grazing would not be affected.

Permanent land use changes at mitigation sites along the Verde River, San Pedro River, and elsewhere in Arizona would be similar to Alternative 2.

## **4.11 Recreation**

### **4.11.1 Affected Environment**

Roosevelt Lake is one of the foremost recreation attractions in central Arizona, with fishing and boating as the most popular recreation activities. Other activities such as camping, wildlife viewing, and sightseeing also are common. The peak recreation season is April 1 to October 1, although usage is year-round (Reclamation 1984).

#### ***4.11.1.1 Water-Based Recreation***

Roosevelt Lake is a primary attraction for water-based recreation users. The lake is renowned for its abundant fishing opportunities and numerous bass tournaments. Fish commonly caught in the lake include largemouth and smallmouth bass, crappie, and channel and flathead catfish (USFS 1994). Shoreline areas where newly inundated vegetation is present provide extra hiding places for structure-oriented fish like crappie and bass, and are popular areas for fishing (Warneke 2002).

There are eight boat launch areas and one marina (Roosevelt Lake Marina) that accommodate boating (Figure 21). Roosevelt Lake Marina operates under a special use permit issued by Tonto National Forest and is located on Roosevelt Lake's southern shore. The marina provides wet slips for boats up to 55 feet. Other popular water sports include water-skiing and jet-skiing.

#### ***4.11.1.2 Camping***

Roosevelt's distance from Arizona's major metropolitan centers dictates that most visitors camp there at least one night. About 2,400 campsites are available around Roosevelt Lake and on isolated islands, 925 of which are developed campground sites along the southern lakeshore (USFS 2001). Tonto National Forest manages these developed campground sites.

#### ***4.11.1.3 Wildlife Viewing and Sightseeing***

Wildlife viewing is a popular activity during the fall and winter, when mule deer, Canada geese, bald eagles, and osprey are commonly seen along the shoreline of Roosevelt Lake. Wildlife viewing opportunities are also present at the Three Bar Wildlife Area southwest of Roosevelt Lake and on National Forest land in the Tonto Basin.

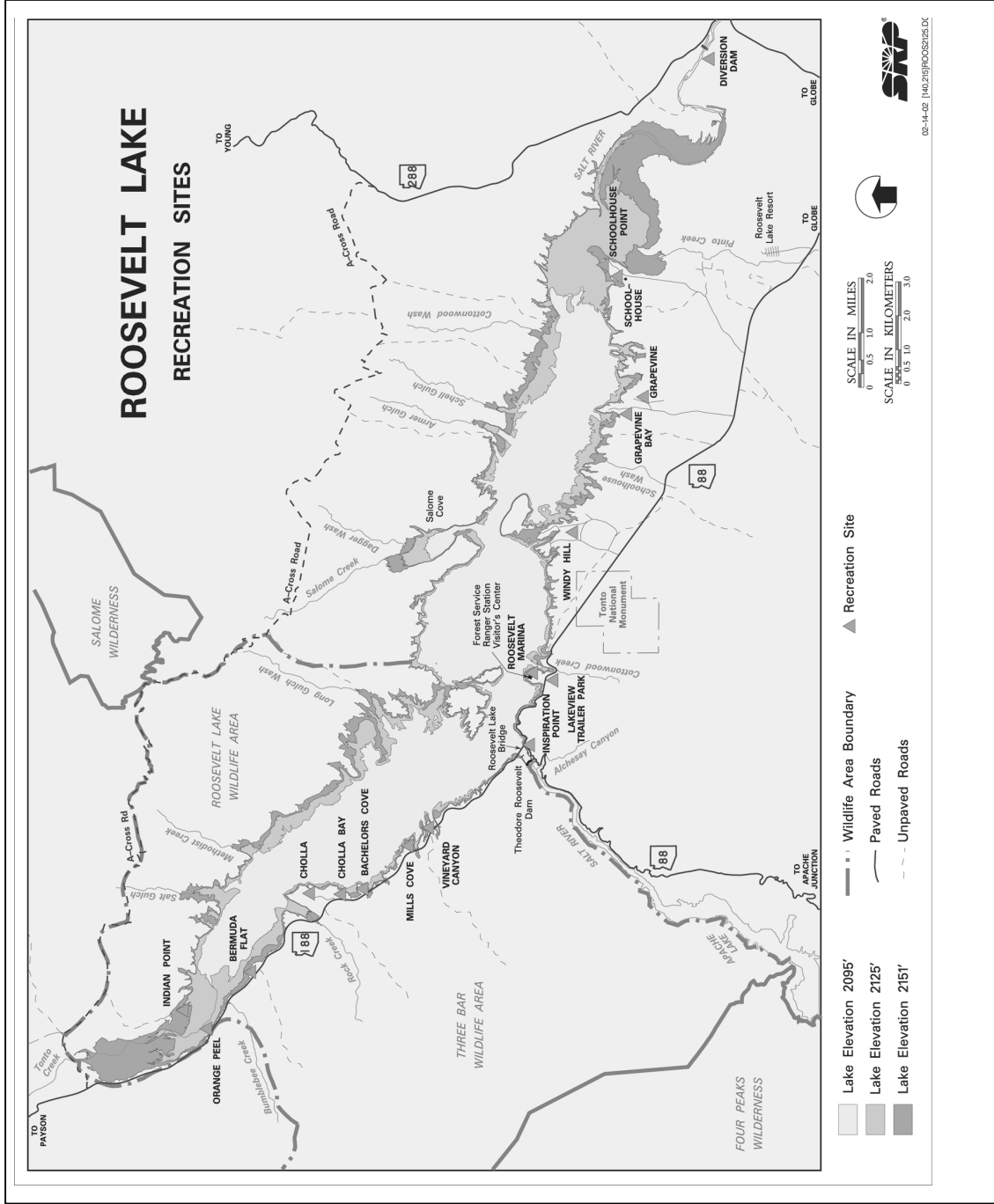
Sightseeing is popular from both automobiles and watercraft. Visitors to the area enjoy the natural scenery, the open water of Roosevelt, and views of the Sierra Ancha and Mazatzal Mountains, Four Peaks Wilderness, Salt River Canyon, and Tonto Basin.

#### ***4.11.1.4 Upgraded and Expanded Recreation Resources Under Reclamation Plan 6***

Recreation facilities, including campgrounds, marinas, interpretive sites, picnic grounds, ranger and aid stations, were moved to higher ground, upgraded and expanded by Reclamation under Plan 6. Plan 6 was the development alternative chosen in 1984 for modification of Roosevelt Dam under the Central Arizona Water Control Study (Reclamation 1990). The new recreation facilities were built between 1991 and 1995 at a cost of more than \$30 million (Reclamation 1990). All of the new recreation facilities were built above an elevation above 2,175 feet in anticipation of periodic inundation below this elevation. The Visitor's Center was built above the new flood surcharge pool behind Modified Roosevelt (elevation 2,218 feet) to ensure safety under any flood. Recreation facilities are listed in Table 20 and shown in Figure 21.

Due to recent dry conditions and the resulting low lake levels, some of the new recreation facilities have been closed and others have been sparsely used (Michaels, pers. comm. 2001). Three boat ramps that have been extended onto the exposed lakebed are currently being used. Dispersed camping and boat launching continues to occur along the shoreline, with temporary sanitary facilities funded through fees paid to the Forest Service (Killibrew, pers. comm. 2001). The new and replacement recreation facilities at Roosevelt have a total daily capacity for 18,825 people (Table 20). Reclamation calculates that this capacity would yield 867,796 recreation days annually for the various activities at the lake (Reclamation 1990).

Figure 21. Recreation Sites at Roosevelt Lake.



**Table 20. Roosevelt Lake recreation site capacities.**

| Site Name                 | Type              | 2001 Operation | Capacity<br>(Persons/day) |
|---------------------------|-------------------|----------------|---------------------------|
| Bachelors Cove            | Family Campground | Open           | 150                       |
| Bermuda Flat              | Family Campground | Open           | 1,000                     |
| Bermuda Flat              | Group Campground  | Open           | 1,000                     |
| Bermuda Flat              | Family Picnic     | Open           | 375                       |
| Blevins Cemetery          | Interpretive Site | Open           | 15                        |
| Cholla                    | Family Campground | Open           | 1,225                     |
| Cholla                    | Boating           | Open           | 675                       |
| Cholla Bay                | Family Campground | Open           | 250                       |
| Diversion Dam North       | Fishing Site      | Open           | 500                       |
| Diversion Dam South       | Fishing Site      | Open           | 1,250                     |
| Grapevine                 | Group Campground  | Open           | 900                       |
| Grapevine                 | Group Campground  | Open           | 800                       |
| Grapevine Bay             | Family Campground | Closed         | 200                       |
| Indian Point              | Family Campground | Closed         | 1,195                     |
| Indian Point              | Boating           | Closed         | 330                       |
| Inspiration Point         | Observation Site  | Open           | 50                        |
| Lakeview Trailer Park     | Family Campground | Open           | 1,000                     |
| Mills Cove                | Family Campground | Closed         | 50                        |
| Orange Peel               | Family Campground | Open           | 100                       |
| Roosevelt Cemetery        | Interpretive Site | Open           | 15                        |
| Roosevelt Cemetery        | Trailhead         | Open           | 15                        |
| Roosevelt Dam Overlook    | Interpretive Site | Open           | 75                        |
| Roosevelt Lake Aid Center | Information Site  | Open           | 15                        |
| Roosevelt Lake Marina     | Private Lodge     | Open           | 150                       |
| Roosevelt Visitor Center  | Interpretive Site | Open           | 300                       |
| Schoolhouse               | Boating           | Closed         | 555                       |
| Schoolhouse               | Family Campground | Closed         | 1,330                     |
| Schoolhouse Point         | Boating           | Closed         | 100                       |
| SR288 Bridge              | Boating           | Open           | 50                        |
| Vineyard Canyon           | Family Picnic     | Open           | 200                       |
| Windy Flat                | Family Campground | Closed         | 50                        |
| Windy Hill                | Family Campground | Open           | 2,255                     |
| Windy Hill                | Group Campground  | Open           | 2,650                     |
| <b>TOTAL</b>              |                   |                | <b>18,825</b>             |

*Source:* Facilities Capacity (Killibrew 2001)

#### **4.11.1.5 Visitor Use**

Although available visitor use information is incomplete for the 1990s, the Forest Service and Reclamation used visual estimates to tally visitation until 1996. The Forest Service estimated that visitation to the Tonto Basin Ranger District increased about 7 percent per year for the years 1992-1996 (Killibrew, pers. comm. 2001). Reclamation estimated there were about 350,000 visitor days at Roosevelt in 1993, approximately 30 percent more than the number of visitors at any other Reclamation impoundment in central Arizona (Wood, pers. comm. 2001). Arizona Game and Fish estimated angler use days at Roosevelt exceeded 1 million in 1999 (Warneke 2002). Using Tonto National Forest's projection of visitor growth and the expanded capacity of the facilities at Roosevelt, it is estimated that visitor days in 2001 were about 600,000.

### **4.11.2 Environmental Consequences**

The analysis of recreational impacts is related to potential changes in water levels in Roosevelt for each of the alternatives. For all alternatives, variations in water levels are likely to affect water-based recreation activities such as boating and fishing, as well as recreation infrastructure such as camping facilities and boat ramps.

The analysis of recreation impacts is qualitative because insufficient visitor use information is available from which to derive a statistical relationship between lake levels and visitor days. Estimates of annual visitor use during the 1990s are incomplete and no accurate estimates are available after 1996. In addition, because Roosevelt has yet to fill to capacity, there are no estimates of actual use under full reservoir conditions. Given the lack of visitor use data, the impacts of the No Action and Re-operation alternatives on recreation use at Roosevelt are qualitatively described below in relation to estimates for the Full Operation alternative.

Although precise estimates of recreation use at alternative reservoir levels are not possible with the available data, research related to recreation economics has generally identified a positive relationship between water levels and recreation use (Platt 2001). As water levels increase or decrease, so does recreation use in a roughly bell-shaped curve (Id.). The tails for the curve represent high and low reservoir levels, where visitation is lower than optimum conditions. On the high end, safety and access issues reduce visitation. On the low end, water quality, access, and poor site attractiveness are among the factors that reduce visitation. In between high and low water levels lies the optimum range for recreation activities at a particular site. As water levels increase above the low-end of the range, so does recreation use. The use peaks at an optimal fill level, and recreation use may decrease as water levels rise further. Although the actual bell curve for a specific reservoir may not be symmetrical, this general relationship between water levels and visitation is considered typical for most reservoirs. At Roosevelt, because water levels above an elevation of 2,151 feet would be limited to less than 20 days (Corps 1997) (the upper-end of the water level), annual visitation during a flood year is likely to be only slightly lower than optimum levels.



#### ***4.11.2.1 Effects of No Permit Alternative (Alternative 1)***

Under the No Action alternative, average end of May reservoir levels would be about 2,085 feet in elevation with a surface area of approximately 11,330 acres or 70 percent of the average surface area under the Full Operation alternative (SRP 2002c). Over the summer, the average water level in Roosevelt would decrease to about 2,067 feet by September. A 30 percent reduction in lake surface area is likely to result in a decrease in recreation use. Recreation facilities such as campgrounds, fishing sites, and picnic areas that were constructed for a higher lake level would be of less value and are likely to experience lower visitor use. Figure 21 illustrates the reduced lake size at a maximum elevation of 2,095 feet and the increased distance of recreation sites from open water.

Camping facilities situated at higher elevation locations such as Indian Point (elevation 2,200 feet) may remain closed when water levels drop below 2,110 feet because visitors prefer camping at sites closer to the water (USFS 2001). Fishing access would be reduced with the shoreline more distant from camping and parking areas, and boat ramps not extending far enough to reach lower water surface levels. Lake water levels would recede below the elevation of many of Roosevelt Lake's 13 boat ramps during the summer. By the end of September, when average surface water elevations decrease to 2,070 feet, only two of Roosevelt's 11 boat ramps (Cholla and Badger boat ramps) would be able to accommodate boaters (McCombe 2002; surface water elevation data on file at ERO). Limited lake access may result in overcrowding during the summer, particularly early in the morning when boat ramp use is greatest.

Fishing opportunities for bass and crappie, which prefer shallow water habitat, would not be as plentiful at reduced reservoir elevations.

A smaller lake with recreation facilities more distance from the lake shoreline, reduced boating and fishing access, and boat crowding may reduce the attractiveness of the site for visitors and reduce recreation activity at Roosevelt. This may indirectly increase recreation demand at other Salt and Verde River reservoirs or other water-based recreation sites in the region. Extending some boat ramps to lower elevations to facilitate launching at lower reservoir levels is one measure that may be feasible to improve lake access for fishing and water based recreation.

#### ***4.11.2.2 Effects of Full Operation Alternative (Alternative 2)***

Average reservoir levels at the end of May would be about 2,120 feet in elevation with a surface area of about 16,400 acres under the Full Operation alternative. There would be no effect on current recreation use at Roosevelt as a result of the Full Operation alternative. No change in existing recreation facilities would be necessary to accommodate projected recreation use at Roosevelt. Actual recreation use would still be related to reservoir elevation and subject to cyclical and seasonal variations in precipitation and runoff.

Implementation of the riparian habitat project at the Rockhouse Farm site on the Salt arm of Roosevelt would have no impact on recreation. River access and nearby recreation parking would be maintained. A gate and/or fencing would be used to prevent public access to the mitigation site and disturbance to protected wildlife habitat.

#### ***4.11.2.3 Effects of Re-operation Alternative (Alternative 3)***

Under the Re-operation alternative, average end of May reservoir levels would be about 2,107 feet in elevation with a surface area of about 14,500 acres or about 90 percent of the average surface area under the Full Operation alternative (SRP 2002c). Although it is not possible to estimate the precise impact of the Re-operation alternative on recreation use, a reduction in the average surface area of 10 percent is likely to result in a decrease in recreation use. Recreation use and the quality of the visitor experience at Roosevelt under the Re-operation alternative is likely to fall between the No Permit and Full Operation alternatives.

### **4.12 Socioeconomics**

#### **4.12.1 Affected Environment**

The socioeconomic influence area of Roosevelt Lake includes the Salt River Project System, the Phoenix Metropolitan area, three Indian reservations, and the agricultural region of Maricopa County located along the Gila and Salt rivers. These areas contain about 60 percent of Arizona's total population (Census 2000). Both Maricopa and Gila counties also benefit from visitors seeking water-based recreation opportunities provided at Roosevelt.

##### ***4.12.1.1 Population***

Maricopa County is the most populous county in Arizona. In 2000, Maricopa County had a population of 3,072,149 residents, reflecting a 44.8 percent increase in population from 1990. Much of this increase can be attributed to population growth in the City of Phoenix and outlying suburbs of Tempe, Chandler, Mesa, and Scottsdale. By 2025, it is estimated the county could be home to almost 5 million people (ASU Arizona Real Estate Center 2002). Gila County's population was 51,335 in 2000, an increase of 27.6 percent from 1990.

The 1999 population of the Fort McDowell Indian Reservation was 964 residents; the population of the Salt River Indian Reservation was 6,600 residents; and the population of the Gila River Indian Reservation was 15,084 residents. While these reservations experienced population growth in the last decade, the total population is small in contrast to the regional population (Arizona Department of Commerce 2000).

##### ***4.12.1.2 Employment and Income***

Maricopa County is a major economic center in the southwestern U.S. and comprises about 65 percent of Arizona's total labor force. In 1999, private sector employers accounted for about 90 percent of jobs in Maricopa County and 83 percent of jobs in Gila County. A list of the top five employment sectors for each county is provided in Table 21.

**Table 21. Top five employment sectors and corresponding percentage of workforce.**

| Maricopa County |                                    |            | Gila County                         |            |
|-----------------|------------------------------------|------------|-------------------------------------|------------|
| #               | Industry                           | Percentage | Industry                            | Percentage |
| 1               | Services                           | 33         | Services                            | 30         |
| 2               | Retail trade                       | 17         | Retail trade                        | 20         |
| 3               | Finance, Insurance and Real estate | 12         | State and local government          | 13         |
| 4               | Manufacturing                      | 9          | Manufacturing                       | 7          |
| 5               | State and local government         | 8          | Transportation and public utilities | 3          |

Among Maricopa County's largest corporations are Motorola, Sperry, and Garret Turbine. Phelps Dodge is the single largest corporation in Gila County. Although not included as one of the top five employment sectors, agriculture is an important source of jobs and income in both Maricopa and Gila counties. In 1999, the agricultural sector in both counties accounted for a total of 27,632 jobs and a total personal income of about \$284 million dollars. The warm climate and irrigation help produce diverse crops including wheat, barley, corn, hay, lettuce, cauliflower, broccoli, melons, fruits, as well as wool and livestock.

November 2001 labor force and employment statistics for Maricopa and Gila counties are provided in Table 22. Unemployment rates for both counties are near the state average of 5.4 percent.

**Table 22. Employment Statistics Table**

| County Name | Total Labor Force | Unemployment Level | November 2001 Unemployment Rate |
|-------------|-------------------|--------------------|---------------------------------|
| Maricopa    | 1,595,438         | 75,799             | 4.8                             |
| Gila        | 17,405            | 1,030              | 5.9                             |

Maricopa County's per capita income of \$28,205 is the highest of any county in Arizona. Gila County's per capita income was 30 percent lower at \$19,000.

#### **4.12.1.3 Housing**

In 2000, Maricopa County had a total of 1,250,231 housing units, most of which were concentrated around Phoenix and its suburbs (Arizona Department of Commerce 2000). In 2001, the average listing price for a residential home in the Phoenix metropolitan area was about \$190,000 (Arizona Regional Multiple Listing Service 2001).

#### **4.12.1.4 Water Use and Hydropower Generation**

Since completion in 1911, Roosevelt Dam has continuously provided water for irrigation, municipal and industrial uses, and hydroelectric power generation. SRP delivers an average of 1 million AF of water each year, including about 600,000 AF from Roosevelt, for use on more than 240,000 acres or 375 square miles (SRP 2001). Most of SRP's deliveries are to cities and urban irrigation uses and form a large portion of the

total municipal water supply to the Phoenix metropolitan population of more than 2.6 million (SRP 2001). Annual surface water diversions by SRP average about 900,000 AF or approximately 40 percent of the water supply to the Phoenix Active Management Area (ADWR 1994).

The power system operated by SRP includes eight hydroelectric units on the Salt River dams with an installed generating capacity of about 260 megawatts. The Roosevelt power plant contains a 36-megawatt turbine generator with a design discharge of 2,400 cfs. SRP supplies power to more than 700,000 customers from a combination of hydroelectric, thermal and nuclear resources (SRP 2001).

#### ***4.12.1.5 Recreation***

As discussed in the Recreation section, Roosevelt provides a variety of water-based recreation opportunities, which are an important component of the local economy.

### **4.12.2 Environmental Consequences**

For all alternatives, socioeconomic impacts are most directly tied to possible changes in the quantity of water supplied for irrigation and municipal use, the amount of hydropower generated, the level of recreation use and spending, and acquisition of mitigation properties. None of the alternatives would directly affect housing, employment or population; however, indirect effects to residents and businesses are possible. Accordingly, the following sections describe socioeconomic impacts specifically related to water supply availability for municipal, irrigation, and hydropower generation, and changes in recreation and visitor use at Roosevelt. In addition, Executive Order 12898 requires evaluation of possible environmental justice issues. These also are evaluated in this section.

#### ***4.12.2.1 Water Supply***

**Approach for Estimating Socioeconomic Impacts Related to Water Supply.** The impact of reservoir operation alternatives on water supply is based on SRPSIM model runs using the 1889 to 1994 period of record. Model runs were conducted for each of the alternatives. A comparison of the model results was used to quantify the surface water available for delivery to SRP and the cities and other water users as previously described in Section 4.2.

The value of the water supply lost as a result of changes in operation of Roosevelt was estimated based on the cost of replacing that supply. Regional water supplies are scarce, so a long-term source of replacement water to offset any losses from changes in Roosevelt operation is limited (see Section 3.6). Effluent reuse was identified as the largest source of potential replacement water and was used to quantify the cost of replacing water lost from changes in reservoir operation.

Effluent produced by the 91st Avenue plant that is not already contractually committed to other uses is the most viable source of a partial, long-term replacement

supply for lost Salt and Verde River water.<sup>54</sup> In order to reuse the effluent, the Sub-Regional Operating Group (SROG)<sup>55</sup> cities would need to construct a tertiary treatment unit at the 91st Avenue plant and route water through a constructed wetland to provide an additional level of wastewater treatment. Storage and delivery of treated waste water would incur costs for ground water recharge facilities, recovery wells, and a distribution system. The estimated cost in 2001 dollars (8 percent interest over 20 years) listed above is \$57,430,000 per year or about \$870/AF/yr. A number of variables may make this estimate low:

- Preliminary planning efforts by the SROG cities have identified a maximum annual volume of 66,000 AF of effluent that may be available in the future for recharge at recharge sites along the Agua Fria; however, in the short term, far less than this annual volume would be available. In addition, the average annual loss of water supply from the No Permit and Re-operation alternatives exceeds 66,000 AF/yr, so more expensive water supplies would have to be obtained to replace any shortages in supply.
- Effluent does not provide any water to cities that are not part of the SROG. SROG includes the cities of Phoenix, Glendale, Mesa, Scottsdale, and Tempe. Effluent reused under this alternative would not represent a replacement supply option for the cities of Peoria, Chandler, Gilbert, Avondale, or Tolleson. These cities would have to obtain more expensive replacement supplies, such as less cost-effective effluent reuse from satellite wastewater plants.
- Total costs for use of treated effluent cannot reasonably be estimated at this time. Additional costs include costs for pipeline construction, right-of-way acquisition, agreements for water delivery, well head treatment, and system losses, as well as environmental, administrative, and legal costs.

**Effects of No Permit Alternative (Alternative 1) on Water Supply.** Under the No Permit alternative, the average annual loss of water supplies to SRP would be 81,700 AF/yr (see Section 4.2). Using the previously estimated replacement cost of \$870/AF/yr, the total cost to replace this water supply would be about \$72 million per year. Much of this cost would likely be passed on to cities and urban irrigation uses situated in the Phoenix Metropolitan Area. The present value of those annual impacts over 50 years is approximately \$1.1 billion using a discount rate of 6 percent.<sup>56</sup>

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<sup>54</sup> The description of the effluent reuse project and the cost estimates were provided to SRP by the SROG cities (Kamienksi, pers. comm. 2002; Greeley and Hansen 1995, 1997).

<sup>55</sup> SROG is the multi-city operating group that owns the 91st Avenue WWTP and the effluent produced by that facility.

<sup>56</sup> The discount rate of 6 percent is based on the long-term weighted average effective rate on SRP revenue bonds (SRP 2002b). The 50-year time period is based on term of the ITP requested for Roosevelt.

In addition, the water supply available to the cities from NCS would decrease 49,400 AF/yr on average. At \$870/AF/yr, the total cost to replace this supply would be about \$43 million per year. The present value of annual impacts over 50 years is approximately \$677 million. This does not include the loss of about \$44 million that the cities invested in modifications to Roosevelt Lake to create the NCS. Also, the cities also would be unable to use their portion of the 65,500 AF/yr of additional ground water pumping by SRP because of regulatory limits on ground water use, potentially causing additional costs for replacement water supplies. The use of effluent to replace Roosevelt water supplies would have future economic consequences because this water would not be available for future growth.

**Effects of Full Operation Alternative (Alternative 2) on Water Supply.** There would be no effect on the available water supplies to SRP or the cities as a result of the Full Operation alternative. The supply of available water for municipal, commercial, and agricultural use would continue and the economic benefit associated with water deliveries would be the same as existing conditions.

**Effects of Re-operation Alternative (Alternative 3) on Water Supply.** The average annual loss of water supplies to SRP would be 24,700 AF/yr under the Re-operation alternative. The total cost to replace this supply would be about \$21.5 million per year using a replacement cost of \$870/AF/yr. As in the case of the No Permit alternative, much of this cost would likely be passed on to cities and urban irrigation uses situated in the Phoenix Metropolitan Area. The present value of those annual impacts over 50 years is approximately \$339 million using a discount rate of 6 percent.

In addition, the cities entitled to NCS water would lose more than 49,400 AF/yr on average. At \$870/AF/yr, the total cost to replace this supply would be more than \$43 million per year. The present value of those annual impacts to the cities over 50 years is approximately \$677 million, not including the foregone investment of about \$44 million in NCS. As noted previously, the cities would be unable to use their portion of the 65,500 AF/yr of additional ground water pumping by SRP. Also, the use of effluent to replace Roosevelt water supplies would have future economic consequences because this water would not be available for future growth.

#### ***4.12.2.2 Hydropower Generation***

**Approach for Estimating Economic Impacts Related to Hydropower Generation.** The impact of reservoir operation alternatives on hydropower generation is based on SRPSIM model runs of anticipated hydrologic conditions. The economic impact of the reservoir operation alternatives was calculated as the net loss in hydropower value compared to existing conditions under the Full Operation alternative. Several key assumptions were used in the analysis of hydropower impacts:

- All spills from Roosevelt are carried throughout the rest of the Salt River storage system because the three lower Salt reservoirs are typically maintained at nearly full levels so there is limited storage available behind those dams.
- All water releases on the Salt River system, including “spills” above the water order, are used to generate power. The monthly spill amounts are averages over the 106-year simulation run. Because averages are used, the monthly generation

capacity of the dams is not exceeded. In reality, in high runoff years, generation capacity likely would be exceeded and water would be by-passed through the spillways. However, in order to provide a conservative estimate of hydropower impacts and to simplify the analysis, long-term average spill amounts are used.

- Constant reservoir heads are used when the reservoir levels are high enough to permit generator operation. In reality, the reservoir operation alternatives, especially the No Permit scenario, would result in lower Roosevelt water levels, which would reduce the head available to generate power. However, the reduction of power head under the alternatives was not considered in order to provide a conservative estimate of hydropower impacts and to simplify the analysis.
- Roosevelt generation ceases when the reservoir elevation is equal to or less than 2,062 feet because this is the minimum head for generation at this location.
- The value of the hydropower (\$/MWh) is based on projections of prices for the period October 2002 through September 2003 (Figure 22). Estimates of future power values are used because recent prices (2000 and 2001) have been affected by unusual conditions in the power market (Day and Meinert, pers. comm. 2001).
- The only costs considered in the impact analysis are the foregone value of the hydropower. The loss of Roosevelt hydropower production may result in the need to construct additional generation and/or transmission capacity and these costs are not included.

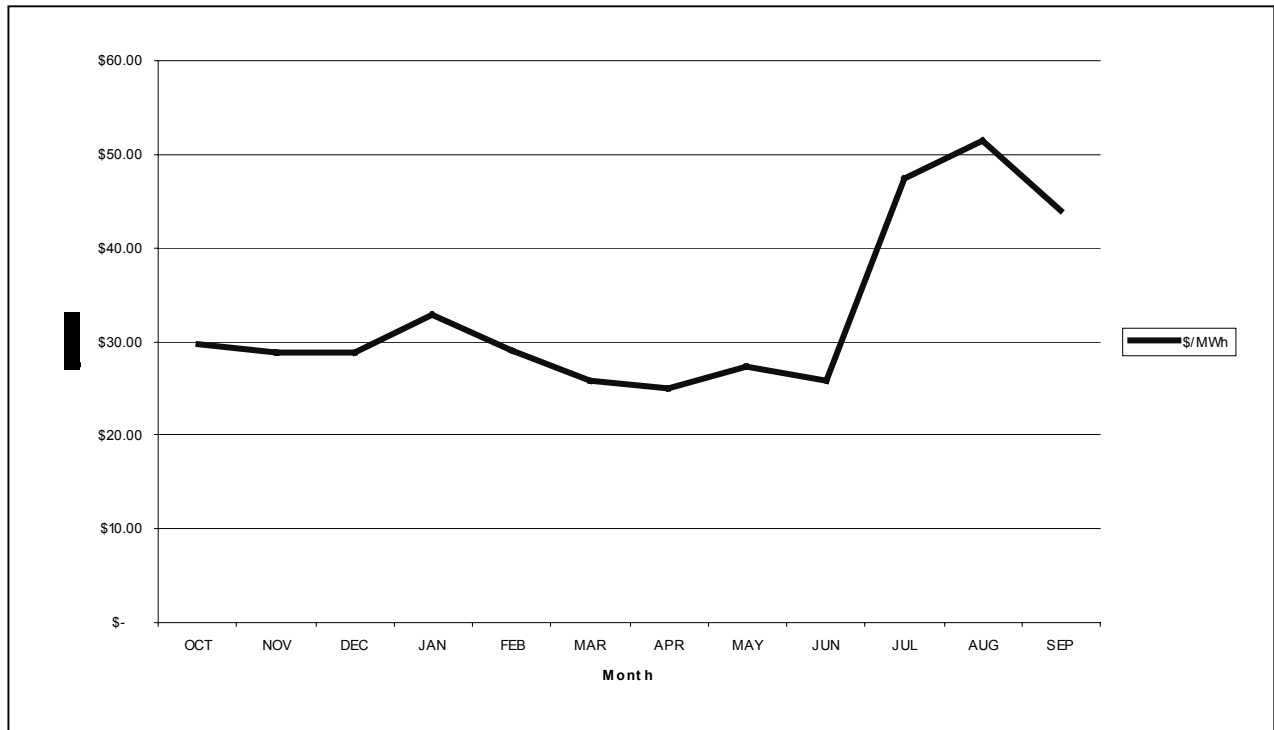
The approach used to estimate the loss of hydropower revenue from reservoir operation alternatives calculates the value of power generation for each month then compares that value to the average annual revenue generated by the baseline or Full Operation alternative.

**Effects of the No Permit Alternative (Alternative 1) on Hydropower.** The average annual value of hydropower lost under the No Permit alternative is about \$2.6 million per year. The present value of annual impacts over 50 years is approximately \$41.0 million using a discount rate of 6 percent.

**Effects of the Full Operation Alternative (Alternative 2) on Hydropower.** There would be no loss of hydropower revenue under the Full Operation alternative. Hydropower revenue would vary annually with available water supplies.

**Effects of the Re-operation Alternative (Alternative 3) on Hydropower.** The average annual value of hydropower lost under the Re-operation alternative is about \$1.3 million per year. The present value of annual impacts over 50 years is approximately \$20.5 million using a discount rate of 6 percent.

**Figure 22. Estimated Value of Hydropower (\$/MWh) for the Period October 2002 through September 2003.**



#### **4.12.2.3 Recreation**

##### **Approach for Estimating Economic Impacts Related to Recreation Visitor Use.**

Currently, there are insufficient data on visitor use and visitor activities to precisely identify the economic impacts from changes in recreation visitor use at Roosevelt. However, the approximate magnitude of the total direct economic impacts from Roosevelt recreation use for the Full Operation alternative is estimated to provide context for the analysis of the other two alternatives. The “benefits transfer” method provides a reasonable approach where site-specific data or models are not available (Platt 1996). This technique is most effective when using data developed within the same region as the site in question (Id.). Table 23 lists recreation use values for the Intermountain West region that have been estimated for recreation activities that are common at Roosevelt. These values are consistent with the average expenditures of visitors to Roosevelt Lake calculated in the 1995-1996 Study of Travel and Tourism in the Globe-Miami Region (Leones et al. 1997). Given the unknown nature of the mix of activities, a simple average of \$31.00 per activity day was used to approximate the 2001 economic value of recreation use at Roosevelt.



**Table 23. Recreation use values for camping, motor boating and fishing.**

| Activity      | Mean Value per Activity Day, 1996 dollars | Mean Value per Activity Day, 2001 dollars, Indexed from 1996 using the CPI |
|---------------|---|--|
| Camping       | \$25.87                                   | \$29.75  |
| Motor boating | \$23.58                                   | \$27.12  |
| Fishing       | \$31.42                                   | \$36.13  |

*Sources:* Rosenberger and Loomis 2001; CPI 2001.

As described in the Recreation section, the new recreation facilities at Roosevelt would yield 867,796 recreation days annually based on the total daily capacity for 18,825 people multiplied by turnover rates for the various activities at the lake (Reclamation 1990). Given the relatively low use by visitors in recent years when lake levels are low, this estimate is assumed to represent years when the lake is full (elevation 2,151 feet) or nearly full. Using the roughly 870,000 visitor days under full reservoir conditions multiplied by the average value per activity day yields a total economic value of about \$27 million per year. The long-term average annual value likely would be less than this total because the reservoir is not full every year.

In order to estimate the long-term average economic value of recreation use under the Full Operation alternative, 1993 visitor data were used to develop an approximation. The reservoir level at the end of May 1993 was at about 2,115 feet, which is nearly the same as the long-term end of May reservoir level modeled under the Full Operation alternative (about elevation 2,120 feet, which equates to about 16,360 surface acres.<sup>57</sup> Reclamation estimated that the 1993 recreation use was 350,000 visitor days. Using the Tonto National Forest's estimate of annual demand increases of 7 percent in recent years and the expanded capacity of the facilities at Roosevelt, the equivalent recreation use estimate for that lake level would be about 600,000 visitor days in 2001 for the average reservoir elevation under the baseline or Full Operation alternative.<sup>58</sup> Multiplying 600,000 visitor days by an average value of \$31.00 per day yields an average economic value of about \$19 million per year.

#### **Effects of No Permit Alternative (Alternative 1) on Recreation Visitor Use.**

Under the No Permit alternative, the average May reservoir surface area would be approximately 11,330 acres or 70 percent of the average surface area under the Full Operation alternative (SRP 2002c). A reduction in surface area of 30 percent is likely to result in a proportionate decrease in recreation use. Although the precise impact is not

<sup>57</sup> End of May reservoir levels are used in this analysis because this is in the early part of the high use recreation season and is assumed to provide a good index for comparisons of alternatives.

<sup>58</sup> Note: 600,000 annual visitor days is likely to be a comparatively conservative estimate of visitor use. According to recent annual user day (AUD) estimates for the entire Salt Lake System, AUDs were as high as 1,350,000 in 1999. Assuming that Roosevelt accounts for 78 percent of the total use, AUDs could be as high as 1,053,000.

known, for every 10 percent decrease in visitor use, the average annual economic impact would be on the order of about \$2 million. Much of this impact would be concentrated in the services sector of the economy, as this is where the majority of Roosevelt visitor dollars in the area are spent (Leones et al. 1997). Thus, if there is a direct relationship between lake level and recreation use, the No Permit alternative would result in an average annual loss of 30 percent or about 180,000 visitor days, with associated direct economic impacts of about \$6 million per year having a present value of approximately \$96 million.

Contributing to the anticipated decrease in recreation and associated revenue is a reduction in access to the lake. Nine of the eleven Roosevelt boat ramps would no longer extend far enough to provide boat access under the No Permit alternative. Extension of five of these boat ramps may be possible unless there are large underwater obstacles or dramatic changes in shoreline slope (McCombe 2002). However, ramps such as Indian Point, Ringtail, Grapevine, and Schoolhouse cannot be extended because of their location at relatively high elevations in the lake. For boat ramps that could be extended, average boat ramp construction costs run about \$106/lane/foot (for a 12 inch thick concrete and aggregate base), plus an additional \$75/foot/side for riprap designed to protect boat ramps from the impacts of waves and erosion (Borgeson, pers. comm. 2002). Detailed studies would need to be conducted on lake bathymetry to determine costs for boat ramp extension. Costs would be greater in areas where shoreline slope is unusually steep.

**Effects of Full Operation Alternative (Alternative 2) on Recreation Visitor Use.**

There would be no change in existing water-based recreation use at Roosevelt as a result of the Full Operation alternative. The economic value of recreation at Roosevelt would vary according to changes in reservoir elevation and the level of recreation use.

**Effects of Re-operation Alternative (Alternative 3) on Recreation Visitor Use.**

Under the Re-operation alternative, the average end of May reservoir surface area would be about 14,500 acres or about 90 percent of the average surface area under the Full Operation alternative (SRP 2002c). A reduction in the average surface area of 10 percent is likely to result in a decrease in recreation use. The precise amount of impact is not known, but the average annual economic impact would be on the order of \$2 million for every 10 percent decrease in visitor use, with a present value of about \$32 million. As in the case of the No Permit alternative, much of this impact would be concentrated in the services sector of the economy, as this is where the majority of Roosevelt visitor dollars are spent (Leones et al. 1997).

**4.12.2.4 Acquisition of Mitigation Properties**

**Economic Effects of No Permit Alternative (Alternative 1) from Acquisition of Mitigation Properties.** There would be no economic impact because no habitat mitigation properties would be acquired.

**Economic Effects of Full Operation Alternative (Alternative 2) from Acquisition of Mitigation Properties.** Implementing mitigation measures at the Rockhouse Farm site on the Salt River arm for the 20-acre pilot project would result in expenditures for site preparation, planting, irrigation, and access. Development of the riparian habitat

would provide short-term construction employment and ongoing operation and maintenance costs.

The purchase and protection of mitigation properties on the Verde and San Pedro rivers, and other locations would require substantial land acquisition costs. Because conservation easements would be established on acquired mitigation properties, there is likely to be a small reduction in local property taxes. Retirement of about several hundred acres of agricultural lands and water rights would have a slight economic effect associated with the loss of agricultural production. The long-term operation and maintenance costs for these lands would provide minor employment opportunities.

**Economic Effects of Re-Operation Alternative (Alternative 3) from Acquisition of Mitigation Properties.** The economic consequences of property acquisition for mitigation sites would be similar to the Full Operation alternative except fewer acres would need to be acquired. Additional long-term operation, maintenance, and management costs would be incurred for these properties.

#### ***4.12.2.5 Environmental Justice***

Executive Order 12898, dated February 11, 1994, calls for identification of minority and low-income populations within the impact area. Of concern is whether those populations would bear disproportionate impacts from the proposed action. For all of the alternatives, there would be no direct impact to minority or low-income populations, because Roosevelt is located entirely within federally owned and managed property. Indirect impacts to minority or low-income populations, within the SRP service area and areas served by the Cities with an interest in Roosevelt, are possible under the No Permit or Re-Operation alternatives, because these alternatives could lead to increased costs for water and power. However, minority and low-income populations would not be disproportionately affected.

### **4.13 Cumulative Effects**

Cumulative impacts are defined as “the impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions” (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant action taking place over time. The Council on Environmental Quality (CEQ), which implements NEPA, requires assessment of cumulative impacts in the decision making process for Federal projects.

Potential cumulative effects to natural, cultural, and socioeconomic resources are possible for each of the alternatives under consideration. The previous description of the affected environment provides baseline information on the past and present actions and the condition of resources related to the proposed project. Important past and present actions include: the original construction of Roosevelt Lake and subsequent modifications; reservoir operational protocols including water storage, release, and flood control; recreation development at Roosevelt; urban and agricultural development of the Salt River Valley; residential and commercial development near Roosevelt; and land management practices on Tonto National Forest lands bordering Roosevelt, such as

grazing, timber harvest, and recreation. The environmental consequences described in this chapter provide information on the potential cumulative effects of the proposed action and alternative actions. Reasonably foreseeable future actions considered in this cumulative effects analysis include: continued urban and rural population growth, increasing demand for water, increasing demand for energy, and increasing demand for recreation opportunities. The potential cumulative effect of past, present, proposed or alternative actions, and reasonably foreseeable future actions are evaluated below for each resource category. The time frame for analysis is the 50-year ITP period.

#### **4.13.1 Water Resources, Flood Control, and Water Quality**

Potential cumulative effects to water resources from alternative reservoir operations are possible within the Salt River watershed downstream of Roosevelt Lake. For the No Permit and Re-operation alternatives, a reduction in storage capacity would reduce available water supplies in the metropolitan Phoenix area. An adverse cumulative effect on the available water supply would be greatest for the No Permit alternative, followed by the Re-operation alternative. A reduction in the available water supply would indirectly adversely impact other local and regional water supplies as alternative sources of water are sought and developed to meet existing and future demands. Also, reuse of effluent would reduce the water supply in the Salt and Gila rivers downstream of the 91<sup>st</sup> Avenue plant. The Full Operation alternative would continue to optimize water storage and utilization and would provide a long-term beneficial effect.

Previous actions that modified Roosevelt to increase flood control storage would be maintained for all alternatives. Because flooding is primarily related to precipitation events rather than upper basin development, no future controllable activities are likely to affect flooding upstream of Roosevelt. The additional flood or pass-through releases from Roosevelt that would occur with the No Permit and Re-operation alternatives due to reduced conservation storage capacity would add to the potential downstream flood-related impacts. The Full Operation alternative would allow additional storage of runoff and flood flows and less frequent spills.

Water quality in Roosevelt is influenced by upstream residential development, mining, grazing, and natural events. Similar sources of pollution in the upper basin could affect future water quality in Roosevelt regardless of the alternative. The No Permit and Re-operation alternatives may result in temporary increases in downstream Salt River turbidity and sediment concentrations due to an increase in spills. The Full Operation alternative would not contribute to any additional cumulative effects to water quality.

#### **4.13.2 Vegetation**

The composition, distribution, and extent of vegetation communities at Roosevelt are the product of dam construction, reservoir operations, and climatic events. As further discussed in the Threatened and Endangered Species section, future reservoir operation is the principal controllable variable affecting vegetation communities within the Roosevelt lakebed. In addition to potential changes in the composition and amount of vegetation affected by each of the alternatives, regional changes in vegetation are possible from

livestock grazing, timber management, and residential development. The cumulative impact to vegetation from these future actions, plus the incremental effect from the proposed and alternative actions, may affect regional vegetation composition.

### **4.13.3 Wildlife**

Directly related to vegetation and reservoir levels, wildlife habitat at Roosevelt varies with reservoir operations and climatic conditions that influence the type of wildlife habitat present. Higher lake levels benefit aquatic species and water-dependent species, while lower lake levels generally favor terrestrial species. Recreational activities such as boating, fishing, off-road ATV use, hiking, and camping have in the past and would continue to influence wildlife use and habitat near Roosevelt regardless of the alternative selected. Cumulative effects to wildlife are not readily comparable by alternative because each alternative would provide habitat for different classes of wildlife.

### **4.13.4 Endangered, Threatened, Candidate, and Sensitive Species**

Cumulative effects for flycatchers, Yuma clapper rails, bald eagles, and cuckoos at Roosevelt as well as the region are possible from past, present, and future actions. In general, habitat for these species throughout the Southwest has been affected in the past by habitat loss from water developments, grazing, residential growth, and agriculture. At Roosevelt, riparian habitat has been affected by reservoir operations, recreation activity, and nearby land use practices. Numerous private parcels are located upstream from Roosevelt along Tonto Creek. Further development or subdivision of these parcels may result in additional direct loss of riparian habitat or land use activities that indirectly contribute to habitat loss through accelerated erosion, channel destabilization, or changes in water quality. FWS has documented numerous unauthorized actions involving manipulation of the active channel on Tonto Creek that directly threaten maintenance or establishment of riparian habitat. Livestock trespass on National Forest lands in the Tonto Creek Riparian Unit have contributed to past disturbance of flycatcher habitat (FWS 1996). Rangeland, FWS has documented similar cases of intentional and unintentional riparian habitat destruction in California and New Mexico. These activities and violations are persistent throughout the range of the covered species, and FWS anticipates that these types of activities would continue legally and illegally on both private and Federal lands.

Elsewhere in central Arizona, increasing development along rivers may have significant effects on listed species. Effects may be directly on individuals or on habitat. Habitat fragmentation can have direct effects including mortality and overall changes in habitat suitability that can further reduce the carrying capacity of a particular habitat patch. Increased development also has the secondary effect of increasing predatory pets. Increases or changes in the types of potential cowbird foraging sites (e.g., bird feeders, golf courses, corrals, and stockyards) may increase the potential for cowbird parasitism of flycatchers or cuckoos. Increased human disturbance including recreational use of the river floodplains, particularly by off-highway vehicles or river floaters, also may adversely affect riparian habitat or disturb bald eagle nesting. In addition, the pumping of

surface and ground water may result in reduced river flows, which in turn would result in decreased habitat quality and quantity.

For all alternatives, statewide and regional loss or degradation of suitable habitat for flycatchers, Yuma clapper rails, and cuckoos is likely to continue. Under the No Permit alternative, a reduction in the maximum elevation of Roosevelt would prevent the loss of existing riparian habitat over the short-term and breeding habitat and productivity would be maintained. Over the long-term, some of the existing habitat is likely to decay in the absence of periodic inundation. Cumulative effects of the No Permit alternative in addition to other past, present, and future actions are difficult to predict because of the uncertainties in how riparian vegetation would respond to changes in reservoir operation and climatic conditions. The same is true for the Full Operation and Re-operation alternatives. The periodic loss of riparian habitat under the Full Operation alternative in addition to regional impacts on riparian habitat would increase cumulative impacts in the absence of mitigation. The acquisition and protection of suitable riparian habitat at several locations is proposed to compensate for this periodic loss of habitat. Likewise, cumulative effects from the Re-operation alternative would occur from partial inundation of existing riparian habitat along with other local and regional impacts to habitat, which also would be compensated with mitigation.

Nationally, bald eagle populations are recovering and their removal from the Federal list of threatened and endangered species is possible in the near future. Cumulative impacts to bald eagles at Roosevelt or regionally from operation of Roosevelt at alternative water levels are expected to be minor. Established bald eagle breeding areas would continue, although a smaller reservoir under the No Permit or Re-operation alternative could increase competition between existing breeding pairs and reduce open water foraging habitat. The Full Operation alternative, which would potentially inundate bald eagle nest trees, would not add appreciably to the regional cumulative effect when mitigation measures are implemented.

Cumulative effects to nesting by flycatchers, Yuma clapper rails, bald eagles, and cuckoos may result from recreation use when the lake is relatively full. In particular, vehicle, boat, or jet-ski activity could disturb nesting birds under all alternatives. Additional protection efforts would be provided under the Full Operation alternative to reduce violations of areas closed during the nesting season.

#### **4.13.5 Visual Resources**

The landscape at Roosevelt has been modified by reservoir construction, recreational development, livestock grazing, and other developments. Additional future development of private lands near Roosevelt may alter the visual quality of the region. A reduction in the maximum water level in Roosevelt for the No Permit and Re-operation alternative would alter the existing visual conditions by reducing the amount of open water on average, resulting in adverse cumulative effects to the regional visual quality. The Full Operation alternative would not add cumulative effects to the local visual quality or characteristics.

#### **4.13.6 Cultural Resources**

Previous effects to cultural resources at Roosevelt have occurred from vandalism, weathering and other disturbances, including inundation. Future similar types of impacts to cultural features near the lake are possible for all of the alternatives. Maintaining a lower lake level for the No Permit and Re-operation alternatives may add to the cumulative effects by exposing cultural sites and increasing susceptibility to vandalism and weathering. Mitigation measures developed for modification to Roosevelt addressed potential impacts to cultural resources from NCS and the Full Operation alternative.

#### **4.13.7 Land Use and Land Ownership**

Land use near Roosevelt has been influenced by the existing reservoir, recreation, livestock grazing, and development. None of the alternatives under consideration would result in substantial changes to land use that would add to the cumulative effect on land use and ownership. Implementation of the Rockhouse Farm riparian mitigation area under the Full Operation alternative would convert 20 acres or more of fallow agricultural land to potential habitat for listed and candidate species. Acquisition of mitigation properties on the San Pedro and Verde rivers would provide long-term protection of natural habitats near locations likely to receive additional development pressure in the future.

#### **4.13.8 Recreation**

Roosevelt provides a popular recreation area that is likely to continue to see a future increase in visitor use from the growing population in central Arizona. Recreation improvements installed with construction of modified Roosevelt in 1996 have increased the capacity and quality of the facilities. The No Permit and Re-operation alternatives may have cumulative adverse effects on regional recreational opportunities by reducing the size of the lake and the ease of access. This may add to the recreational demand at other recreation sites in the region. The Full Operation alternative would not add any cumulative effects to recreational use.

#### **4.13.9 Socioeconomics**

The agricultural and business development of the greater Phoenix area has largely been made possible by the development, storage, and distribution of water supplies. Future population growth and development is expected to continue in the Phoenix area, as is the need for providing municipal and commercial water supplies. Existing water supply sources, as well as development of future water supplies, would be necessary to meet anticipated demand. The reduction in Roosevelt water storage capacity for the No Permit and Re-operation alternatives would require the development of replacement water supplies to meet demand. Alternative water supply sources, such as treatment and use of wastewater effluent, additional ground water pumping, or construction of new reservoirs to replace Roosevelt water would need to be developed to the extent possible, but would reduce the supply available to meet future growth. The cumulative economic effect is likely to include an increased cost to consumers for water, possible impacts to business development, and the indirect effects to the local and regional economy

associated with a reduced water supply and higher cost. No cumulative impacts to the available water supply or the economy were identified for the Full Operation alternative.

The growing population in the southwest U.S. and Arizona has resulted in an increased demand for energy. The hydropower currently provided by Roosevelt provides a component of meeting the energy demands for the Phoenix area. Both the No Permit and Re-operation alternatives would reduce the hydropower output from Roosevelt Dam and other SRP reservoirs and would have a cumulative impact on the local and regional energy supply. To replace this loss of energy would require a higher cost for purchasing additional energy from alternative sources and a possible long-term cost in expanding or building replacement energy generation or transmission capacity. The Full Operation alternative would not add any cumulative impacts to the local or regional energy supply.

Anticipated future growth in the Arizona population is expected to increase the demand for recreation activities. A reduction in the water level at Roosevelt for the No Action and Re-operation alternatives is likely to reduce recreational use and opportunities at Roosevelt and additional recreational use at other recreation sites. A shift in recreation to other locations would have adverse economic consequences for recreation-related businesses near Roosevelt and beneficial economic consequences at other regional recreation sites. Under the Full Operation alternative, the existing visitor capacity and opportunities at Roosevelt would remain unchanged. As the regional population grows, recreational facilities at Roosevelt would help meet that demand.

## **4.14 Unavoidable Adverse Effects**

It is not always possible to avoid adverse effects from implementation of an alternative. Unavoidable adverse effects for each of the alternatives are discussed below.

### **4.14.1 No Permit Alternative (Alternative 1)**

If this alternative were implemented, there would be an unavoidable loss in a portion of the water supply, power, and recreational opportunities provided by Roosevelt Lake. In the near term, the loss of water supply could create critical shortages in the Phoenix area. Although some of the water supply might be replaceable over time, the development of replacement water supplies would have significant adverse effects on the regional economies because of the cost, planning, and construction activities needed to replace lost supplies. A long-term adverse affect to federally listed and candidate species habitat is likely to occur if Roosevelt is maintained at a lower elevation because conditions for creating areas of suitable habitat similar to existing habitat would not be possible.

### **4.14.2 Full Operation Alternative (Alternative 2)**

Short-term unavoidable adverse effects to flycatcher, Yuma clapper rail, and cuckoo habitat would occur when Roosevelt is filled and existing riparian habitat is lost because of inundation.



#### **4.14.3 Re-Operation Alternative (Alternative 3)**

Unavoidable adverse effects for this alternative would be similar to the No Permit alternative, except the extent of the impacts would be less with a higher average reservoir level.

### **4.15 Relationship of Short-Term uses and Long-Term Productivity**

All alternatives result in a long-term use of the environment for water storage and riparian habitat, but each alternative has trade-offs in the short- and long-term effects to various resources.

#### **4.15.1 No Permit Alternative (Alternative 1)**

The No Permit alternative would result in a long-term loss in water supplies and power production from reduced storage and increased reservoir spills. A long-term loss in recreational opportunities at Roosevelt also would occur with a smaller reservoir. The amount of habitat for flycatchers, Yuma clapper rails, and cuckoos would benefit in the short-term, but extended reductions in reservoir elevations would lead to a long-term loss in habitat for these species. Bald eagle productivity would decrease over the long-term because a smaller reservoir size results in a decrease in prey productivity and an increase in interspecific competition.

#### **4.15.2 Full Operation Alternative (Alternative 2)**

This alternative would result in a short-term decrease in habitat for flycatchers, Yuma clapper rails, and cuckoos, but over the long-term is expected to provide more suitable habitat for these species on average, particularly from the acquisition and management of riparian habitat at other locations in central Arizona in perpetuity. Maintenance of higher reservoir levels at Roosevelt would have a beneficial effect on the long-term productivity of bald eagles.

#### **4.15.3 Re-Operation Alternative (Alternative 3)**

The Re-Operation alternative would result in intermediate levels of short and long-term effect between the No Permit and Full Operation alternatives. This alternative would likewise trade short-term habitat protection for flycatchers, Yuma clapper rails, and cuckoos for a possible long-term decrease in habitat. The Re-Operation alternative also would result in a reduction in bald eagle productivity compared to the Full Operation alternative. A long-term loss in water and power supplies and the associated benefits would occur with this alternative.

## **4.16 Irreversible and Irretrievable Commitments of Resources**

Irreversible commitments of resources are those that cannot be reversed, except perhaps in the very long-term. Irretrievable commitments are those that are lost for a period of time.

### **4.16.1 No Permit Alternative (Alternative 1)**

A reduction in the conservation storage capacity at Roosevelt may result in the irreversible loss of water rights for SRP, the Cities, and others that hold legal surface water rights. A substantial portion of the additional water that is spilled and unavailable for use would be an irretrievable loss to SRP and the Cities. The loss in hydropower production and recreation use at Roosevelt also would be an irretrievable loss.

### **4.16.2 Full Operation Alternative (Alternative 2)**

The commitment and funding for acquisition of mitigation properties would be irreversible. The intent of the purchase and management of mitigation habitat is to protect these site in perpetuity for the benefit of listed and candidate species.

### **4.16.3 Re-Operation Alternative (Alternative 3)**

The irreversible and irretrievable effects for this alternative would be similar to the No Permit alternative, although the commitment of conservation storage capacity to short-term habitat preservation would be less. This alternative would also commit to the acquisition and management of mitigation properties, although less than the Full Operation alternative.



# Chapter 5

## List of Preparers and Recipients of the Draft Environmental Impact Statement

This chapter includes a list of preparers and contributors to the DEIS and a list of recipient of the DEIS. Information on scoping, public involvement, and key issues is included in Chapter 1.

### 5.1 Preparers and Contributors

#### Fish and Wildlife Service

| Name           | Responsibilities                               | Education   | Years Experience |
|----------------|--|---|------------------|
| Sherry Barrett | Assistant Field Supervisor, Project Management | B.S. Biology<br>M.S. Zoology                              | 21               |
| Jim Rorabaugh  | Biology and Document Review                    | B.S. Zoology<br>M.S. Animal Ecology                       | 22               |
| Greg Beatty    | Biology and Document Review                    | B.S. Wildlife Management                                  | 11               |
| Leslie Dierauf | Southwest Regional HCP Coordinator             | B.S. Microbiology and English<br>DVM. Veterinary Medicine | 28               |

#### ERO Resources Corporation

| Name            | Responsibilities   | Education  | Years Experience |
|-----------------|--|--|------------------|
| Craig Sommers   | Project Manager  | B.S. Soil and Water<br>M.S. Resource Economics   | 23               |
| Mark DeHaven    | EIS Preparation, NEPA Compliance                           | B.A. Business<br>M.S. Natural Resources  | 23               |
| Steve Dougherty | Threatened and Endangered Species, Vegetation              | B.S. Biology   | 25               |
| Aleta Powers    | Threatened and Endangered Species, Cultural Resources      | B.A. Geography/ Sociology  | 8                |
| Andy Cole       | Vegetation, Wetlands, Wildlife, Geology/Soils, Air Quality | M.F.S.; Forest Science   | 10               |
| Scott Babcock   | Visual Resources, Land Use, Recreation, Socioeconomics     | B.A. Biology, Environmental Conservation<br>M.S. Environmental Management, Resource Economics and Policy | 4                |

### **ERO Resources Corporation (continued)**

|                            |  |   |    |
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| Sally Speers<br>Dischinger | Wildlife, Vegetation, Recreation,<br>Forest Management | B.S. Forestry<br>M.S. (in progress) Biology   | 5  |
| Steve Hannula              | Modeling   | B.S. Geology<br>M.S. Engineering              | 7  |
| Justin Spring              | Water Resources  | B.A. Environmental Science,<br>Biology        | 4  |
| Janelle Luppen             | GIS  | B.A. Land Use (GIS emphasis)                  | 5  |
| Sadie Russo                | GIS  | B.A. Natural Resource<br>Management           | 5  |
| Mark Bina                  | Graphics   | B.S. Art                                      | 20 |
| Martha Clark               | Technical Editor, Document<br>Production               | B.A. English                                  | 15 |

### **Salt River Project**

| Name                         | Responsibilities                                 | Education   | Years<br>Experience |
|------------------------------|--|---|---------------------|
| Charles Ester III            | Reservoir Operations, Hydrology                  | B.S. Hydrology  | 19                  |
| John Keane                   | Biology, Cultural Resources                      | B.A. Anthropology<br>M.S. Watershed Management<br>Ph.D. (in progress) Geography | 20                  |
| Shelly Dudley                | History  | B.A. Secondary Education<br>M.A. History  | 23                  |
| Janine Spencer<br>(contract) | Threatened and Endangered<br>Species, Vegetation | B.S. Biology/Animal Science<br>M.A. Wildlife Biology                            | 11                  |
| Lynn Bredimus                | Cartography                                      | B.A. Fine Arts  | 16                  |
| Andrea Julius                | Cartography                                      | B.A. Geography  | 22                  |
| Jim Cooper                   | Technical Support                                | B.S. Physical Geography   | 18                  |

### **Bureau of Reclamation**

| Name          | Responsibilities  | Education  | Years Experience |
|---------------|---|--|------------------|
| Bruce Ellis   | Chief, Environmental Resources, EIS Document Review                                   | B.A. Anthropology                                  | 25               |
| Henry Messing | Wildlife Biologist, Biology, EIS Document Review                                      | B.S. Biology<br>M.S. Biology                       | 24               |
| Susan Sfera   | Southwestern Willow Flycatcher Conservation Coordinator, Biology, EIS Document Review | B.S. Natural Resources<br>M.S. Wildlife Management | 5                |
| Sandra Eto    | Environmental Protection Specialist, NEPA Compliance, EIS Document Review             | B.A. Sociology                                     | 25               |

## **5.2 EIS Recipients**

The following is a partial list of agencies, organizations, and individuals received the Draft EIS. A complete list of agencies, public officials, organizations, and individuals to whom a copy of the Draft EIS was sent is on file at the Fish and Wildlife Service's Phoenix office.

### **5.2.1 Federal, State, and Local Agencies and Indian Tribes**

- Arizona State Parks
- Arizona Department of Commerce
- Arizona Department of Environmental Quality
- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- City of Chandler
- City of Gilbert
- City of Glendale
- City of Globe
- City of Mesa
- City of Payson
- City of Peoria
- City of Phoenix
- City of Scottsdale
- City of Tempe
- Fort Apache Indian Agency
- Fort McDowell Indian Community
- Gila County
- Gila County Board of Supervisors

Gila River Indian Community  
Hopi Tribe  
Maricopa County  
Maricopa County Board of Supervisors  
National Park Service  
Natural Resources Conservation Service  
Natural Resources, Agriculture and Environment Committee  
Salt River Pima-Maricopa Indian Tribe  
San Carlos Apache Tribe  
State Historic Preservation Office  
State Land Department  
Tonto Apache Tribe  
Tonto National Forest  
U.S. Army Corps of Engineers  
U.S. Environmental Protection Agency Region IX  
U.S. Geological Survey-Biological Resources Division  
White Mountain Apache Tribe  
Yavapai-Prescott Tribe

### **5.2.2 Federal and State Legislators**

Senator Jon Kyl  
Senator John McCain  
Congressman Jeff Flake  
Congressman J.D. Hayworth  
Congressman Jim Kolbe  
Congressman Ed Pastor  
Congressman John Shadegg  
Congressman Bob Stump  
Office of the Governor: Governor Jane Hull  
State Representative Debra Brimhall  
State Representative Jake Flake  
State Representative Mike Gleason  
State Senator Jack Brown  
State Senator Herb Guenther

### **5.2.3 Organizations**

American Rivers  
Arizona Cattle Growers Association  
Arizona Municipal Water users Association  
Arizona Nature Conservancy  
Arizona Rivers Coalition  
Arizona State University-Department of Zoology  
Arizona Wilderness Coalition  
Arizona Wildlife Federation  
Buckeye Irrigation District

Center for Biological Diversity  
Central Arizona Project  
Defenders of Wildlife  
Forest Guardians  
Friends of Arizona Rivers  
Friends of Pinto Creek  
Maricopa Audubon Society  
National Wildlife Federation  
Phoenix Earth First  
Phoenix Sportsman Association  
Roosevelt irrigation District  
Roosevelt Marina  
Roosevelt Water Conservation District  
Sierra Club  
Sonoran Audubon Society  
Trout Unlimited  
University of Arizona





## Chapter 6

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## GLOSSARY

**Acre-feet (AF):** The volume of water (325, 851 gallons) that would cover one acre, 1-foot deep.

**Conservation:** Methods and procedures necessary to recover an endangered or threatened species, including research, census, law enforcement, habitat acquisition, habitat protection, habitat maintenance, species propagation, and live trapping and transportation.

**Covered Species:** Unlisted species that have been adequately addressed in an HCP as though they were listed, and are therefore included on the permit, or alternately, for which assurances are provided to the permittee that such species will be added to the permit if listed under certain circumstances. Covered species are also subject to the assurances of the “No Surprises” policy.

**Critical Habitat:** Defined in the federal Endangered Species Act (1973) to include the area occupied by a species at the time it is listed, specific areas in the vicinity of the occupied habitat, and specific areas away from the occupied habitat considered essential for the conservation of the species and that may require special management considerations or protection.

**Cumulative Impact:** Under NEPA regulations, the incremental environmental impact or effect of the action together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. (40 CFR 1508.7) Under ESA section 7 regulations, the effects of future state or private activities not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02)

**Dispersal:** The movement, usually one-way, and on any time scale, of plants or animals from their point of origin to another location where they subsequently produce offspring.

**Ecosystem:** A complex ecological community and environment forming a functioning whole in nature; a complex interaction among plant and animal species and their physical environment.

**Endangered Species:** Any plant or animal species in danger of extinction in all or a significant part of its range.

**Endangered Species Act:** Federal act of 1973, as amended, 16 U.S.C. Sections 1531-1543.

**Environmental Impact Statement (EIS):** Document prepared in accordance with federal law to describe, analyze, and consider mitigation of the significant environmental effects of a project, plan, or action.

**Extinct:** Disappearance of a species due to failure to reproduce sufficient numbers to maintain succeeding generations.

**Flood Control Pool/Space:** Reservoir volume above the active conservation pool that is reserved for flood runoff and then is evacuated as soon as possible to keep that space in readiness for the next flood.

**Flood Surge Pool/Space:** Reservoir volume between the flood control pool/space and the maximum design elevation behind the dam.

**Floodplain:** The land adjacent to a river, which is subject to inundation during high water flows when the river's water level rises above its established banks. The 100-year floodplain refers to that area of land that will be inundated during a flood of a severity that may only take place once every 100 years.

**Habitat:** The combination of environmental conditions of a specific place occupied by a species or a population of such species.

**Habitat Conservation Plan (HCP):** An implementable program for the long-term protection and benefit of a species in a defined area; required as part of a Section 10(a)(1)(B) permit application under the federal Endangered Species Act.

**Harm:** Defined in regulations implementing the ESA promulgated by the Department of Interior as an act "which kills or injures" listed wildlife; harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering". (50CFR 17.3)

**Harass:** Defined in regulations implementing the ESA promulgated by the Department of Interior as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering". (50 CFR 17.3)

**Historical Range:** The known general distribution of a species or subspecies as reported in current scientific literature.

**Home Range:** The area to which the activities of an animal are confined during a defined period.

**Implementing Agreement:** An agreement that legally binds the permittee to the requirements and responsibilities of a conservation plan and section 10(a)(1)(B) permit. It may assign the responsibility for planning, approving, and implementing the mitigation measures under the HCP.

**Incidental Take:** The take of a federally listed wildlife species, if such take is incidental to, and not the purpose of, carrying out otherwise lawful activities. Also see "take" below.

**Incidental Take Permit (ITP):** A permit that exempts a permittee from the take prohibition of section 9 of the ESA issued by the FWS or NMFS pursuant to section 10(a)(1)(B) of the ESA.

**Lead Agency:** The public agency that has the principal responsibility for carrying out or approving a project.

**Listed Species:** Species, including subspecies and distinct vertebrate populations, of fish, wildlife, or plants listed as either endangered or threatened under section 4 of the ESA.

**Mitigation:** Measures undertaken to diminish or compensate for the negative impacts of a project or activity on the environment, including: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments.

**Monitoring:** The process of collecting information to document implementation of mitigation measures and to evaluate whether the objectives of the habitat conservation plan are being realized.

**Population:** A collection of individuals that share a common gene pool.

**Population Density:** Number of individuals of a species per unit area.

**Probable Maximum Flood:** The maximum runoff condition that would result from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of a particular drainage basin.

**Raptor:** A bird of prey (e.g., eagle, owl, hawk, or falcon).

**Rare Species:** A species of plant or animal that has limited numbers and/or distribution.

**Recovery Plan:** A plan to ensure the conservation and survival of endangered and threatened species. Recovery plans give priority, to the extent feasible, to those endangered or threatened species that are or may be in conflict with construction or other development projects of other forms of economic activity.

**Reservoir Conservation Storage:** That portion of useable reservoir capacity available for seasonal or cyclic water storage. Synonymous with active storage.

**Root Crown:** The base of the stem or trunk of plant where it contacts the ground surface.

**Section 7:** A section of the federal Endangered Species Act that provides for consultation between federal agencies and the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

**Section 9:** A section of the federal Endangered Species Act that prohibits the “take” of any endangered species.



**Section 10(a)(1)(B):** An amendment to the federal Endangered Species Act that allows for incidental take of a threatened or endangered species if the permit for the proposed activity is accompanied with a habitat conservation plan that will demonstrably benefit the species.

**Sensitive Species or Species of Concern:** Species that are rare, that have preternaturally small or declining populations, or whose probability for long-term survival is in question.

**Species:** Any distinct population of wildlife that interbreeds when mature.

**Take:** As defined in the federal Endangered Species Act, take means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a species [listed as threatened or endangered], or attempt to do so.” “Harass” and “harm” are further defined in federal regulations and case law as follows:

“Harass” means an intentional or negligent act or omission that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering.

“Harm” means an act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

**Territory:** The area that an animal defends, usually during breeding season, against intruders of its own species.

**Threatened Species:** Any species or subspecies that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**Viability:** The ability of a population to persist. The converse of vulnerability or the propensity of a population to go extinct.

## **INDEX**

An index for this document was not generated because most of the key terms are used frequently throughout the document. The table of contents (pages i-vii) provides the best index for locating information."



**APPENDIX A: STATUS DEFINITIONS**

**ARIZONA GAME AND FISH DEPARTMENT**  
**HERITAGE DATA MANAGEMENT SYSTEMS**

**FEDERAL STATUS**

**ESA Endangered Species Act (1973 as amended)**

U.S. Department of Interior, Fish and Wildlife Service (<http://arizonaes.fws.gov>)

**Listed**

- LE** Listed Endangered: imminent jeopardy of extinction.
- LT** Listed Threatened: imminent jeopardy of becoming Endangered.

**XN** Experimental Nonessential population.

**Proposed for Listing**

- PE** Proposed Endangered.
- PT** Proposed Threatened.

**Candidate** (Notice of Review: 1999)

- C** Candidate. Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.
- SC** Species of Concern. The terms “Species of Concern” or “Species at Risk” should be considered as terms-of-art that describe the entire realm of taxa whose conservation status may be of concern to the USFWS, but neither term has official status (currently all former C2 species).

**Critical Habitat** (Check with state or regional USFWS office for location details).

- Y** Yes: Critical Habitat has been designated.
- P** Proposed: Critical Habitat has been proposed.
- [N]** No Status: certain populations of this taxon do not have designated states (check with state or regional USFWS office for details about which populations have designated status)].

**USFS U.S. Forest Service (1999 Animals, 1999 Plants)**

U.S. Department of Agriculture, Forest Service, Region 3 (<http://www.fs.fed.us/r3/>)

- S** Sensitive: Those taxa considered sensitive by the Regional Forester and occurring on National Forests in Arizona.

**BLM U.S. Bureau of Land Management (2000 Animals, 2000 Plants)**

U.S. Department of Interior, Bureau of Land Management, Arizona State Office (<http://azwww.blm.gov>)

- S** Sensitive: Those taxa considered sensitive by the Arizona State Office and occurring on BLM Field Office Lands in Arizona.
- P** Population: Only those populations of Banded Gila monster (*Heloderma suspectum cinctum*) that occur north and west of the Colorado River are considered sensitive by the Arizona State Office.

**STATE STATUS**

**AZ NPL Arizona Native Plant Law (1993)**

Arizona Department of Agriculture (<http://agriculture.state.az.us/PSD/nativeplants.htm>)

- HS** Highly Safeguarded: No collection allowed.
- SR** Salvage Restricted: Collection only with permit.
- ER** Export Restricted: Transport out of State prohibited.
- SA** Salvage Assessed: Permits required to remove live trees.
- HR** Harvest Restricted: Permits required to remove plant by-products.

**AGFD Wildlife of Special Concern in Arizona (1996 in prep.)**

Arizona Game and Fish Department (<http://www.azgfd.com>)

- WC** Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Arizona Game and Fish Department's listing of Wildlife of Special Concern in Arizona (WSCA, in pre.). Species indicated on printouts as WC are currently the same as those in *Threatened Native Wildlife in Arizona* (1988).